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ENVIRONMENTAL CHANGES IN NORTH-EASTERN ROMANIA – A TRIGGER FACTOR FOR LYME DISEASE

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Abstract

Lyme disease is a zoonosis with systemic clinical manifestations, determined by species of the genus *Borrelia* and transmitted to humans through the sting of infected ticks. In order to assess the incidence of Lyme borreliosis among patients in the North-Eastern part of Romania, we performed a retrospective study, following the cases of patients with tick bites who presented themselves at the "Sf. Parascheva" Infectious Diseases Clinical Hospital, Iasi, between 1 January 2017 and 31 December 2017. We encountered 1257 cases, of which 89 suspected of borreliosis, most from rural area, the average age being 27 years. Although the number of confirmed or probable cases of Lyme disease is small compared to the total number of patients stung by ticks, we should not neglect preventive measures and antibiotic prophylaxis when appropriate. The fact that climate change in recent years and pet ownership have led to an increase in the incidence of borreliosis in the population is unquestionable.

Keywords: borreliosis, erythema migrans, pets, tick

1. Introduction

Lyme boreliosis is an infectious disease caused by *Borrelia burgdorferi*, a spirochete transmitted by tick bite. It manifests through cutaneous, neurological, cardiac and articular damage. The infection occurs more frequently between May and November, with a peak incidence in June and July (Wasiluk et al., 2011).

Since the Center for Disease Control and Prevention started surveying the infection, the number of Lyme disease cases increased significantly, being declared the most common infection caused by a vector. But due to the varying quality of disease reporting and registration systems in the country, the true incidence of brucellosis is not fully known (Mandell et al., 2009).

Climate change is considered a threat to the environment, causing changes in ecosystems and unusual multiplications in different species (DellaSala et al., 2018). Among the causes that have led to the increase in tick numbers are climate change, global warming and excessive humidity. A realistic forecast on climate change in recent years shows that global temperature has increased steadily, 2017 being the warmest year in the history of weather records (Lin et al., 2019). Romania has been and will continue to be affected by these changes (Manciuc et al., 2018). Weather forecasts reveal that in Romania there will be an increase in average temperatures of over four degrees Celsius over the next 50 years, so we might expect this to further influence the tick population (Fig. 1).

The age structure of the Romanian population reflects a slow but continuous process of demographic aging, mainly due to the decrease in the birth rate that led to the reduction of the young population (0-14

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years) and to the increase of the elderly population (65 years and over). This older age group does not often come in contact with vegetation, in order to contact ticks. However, there has been an increasing tendency for people over 65 years to adopt pets. A dog or cat, which are the most common pets in Romania, are active, dynamic animals that influence both the mental and emotional state of elders, and their level of activity. However, these animals spend most of their time outdoors and can frequently come in contact with ticks and bring them in the household. According to statistics there are countries where the number of animals is really impressive. It is also the case of the United States of America, which boasts 237 cats per 1,000 inhabitants. The presence of pets being another factor that increase the incidence of borreliosis among the population. In the United States, for example, studies have shown that the risk of infection and the emergence of Lyme disease is two times higher among pet owners, even if the animals are vaccinated and dewormed properly (Guerra et al., 2002).

Borreliosis is a disease of the 20th century, whose pathogen was first described in 1982. The first event in the disease may be represented by a distinctive skin lesion, called erythema migrans, a macula / papule with an annular extension of at least 5 cm in diameter. This is followed by systemic symptoms such as physical fatigue, fever, headache, myalgia. Within weeks to months after the appearance of erythema migrans, the patient may develop neurological abnormalities such as aseptic meningitis, neuritis, facial paralysis, chorea, cerebellar ataxia, myelitis, encephalitis. There may also be cardiac abnormalities such as heart block, myopericarditis acute cardiomegaly, and joint problems – edema and pain in the large joints, chronic arthritis (Heymann, 2012). A positive boreliosis diagnosis is established by isolating the agent from samples taken from the patient. The serological tests frequently used are: enzyme-linked immunosorbent assay (ELISA), Indirect Immunofluorescence, Western Blotting (Fig. 1). Biopsy isolation from the skin tissue sample or blood sample and Polymerase Chain Reaction (PCR) are two other useful investigations (Steere, 2001).

Due to the limitation of laboratory tests, the diagnosis is often based on clinical, anamnestic and positive antibody data in patients with erythema migrans (Rebedea, 2002). Evolution is favorable and has good prognosis under prompt and correct treatment. If the untreated disease progresses the likelihood of nervous system damage increases. Reinfection may occur in people who are living or working in endemic areas (woodland / bushes) and the *Borrelia* serotype may be different from the previous infection.

Various manifestations of Lyme disease can be treated with oral antibiotics (Doxicicline, Amoxicillin, Cefuroxime axetil, Erythromycin), except for patients with objective neurological manifestations and some patients with Lyme arthritis who may require intravenous (Ceftriaxone) therapy (Rebedea, 2002). Prophylaxis is very important in order to prevent reaching the neurological stage. Preventive measures consist of educating the population about transmission, using chemical solutions in order to modify the environment in which ticks live, avoiding infected areas when possible, and rigorous examination of the body after exposure to areas where ticks may reside. If a tick is found, it should be removed quickly (<24h) (Centers for Disease Control, 1990, 1995). After removal of the tick and the initiation of prophylactic treatment, serology for Lyme disease – *Borrelia burgdorferi* IgG and IgM antibodies – should be performed in 21 days (Kiss et al., 2016; Mandell et al., 2009).

According to the National Center for Communicable Disease Control and Prevention, the incidence of Lyme disease in Romania is decreasing in recent years. In 2016, they entered the national surveillance system and 688 suspected cases of Lyme disease were finalized, 11% less than in the previous year, 270 cases being confirmed (Fig. 2). Of these, 38 (14.07%) of cases were registered in the North-East part of the country, 11 (4.1%) cases only in Iasi. The specific incidence analysis on WHO age groups reveals that the age group most affected was 25-34 years, but also patients over 60 years old, with the predominance of female gender (INSP, 2016).
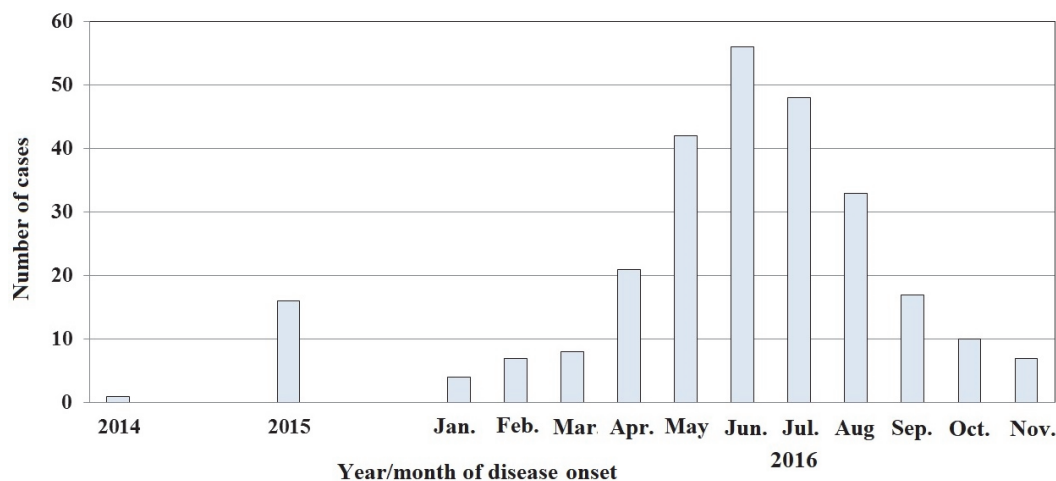

Fig. 1. Distribution of Lyme disease cases after the year / month of disease onset in Romania (INSP, 2016)
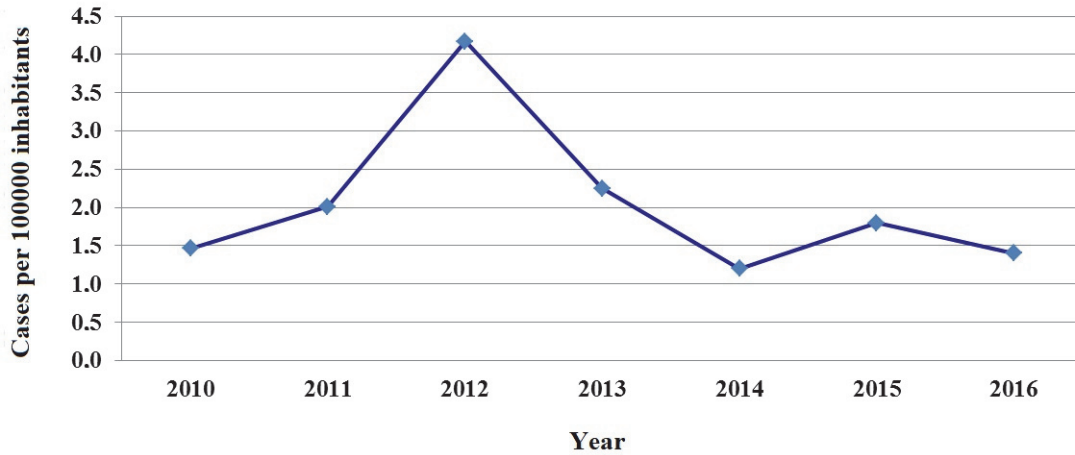
Fig. 2. Incidence of Lyme disease in Romania during 2010-2016 (INSP, 2016)

We performed an epidemiological and retrospective study that included all patients diagnosed with Lyme disease or who were stung by ticks and who have been evaluated and received treatment at the Sf. Parascheva Clinical Hospital of Iasi, between January 1 2017 and 31 December 2017.

We have focused our interest on people who have carried out laboratory investigations by day or on-going hospitalization during this 12-month period, but we've also statistically analyzed the number of people who reported in the triage service saying they were stung by tick. The investigation followed the two-step approach for the serologic diagnosis of Lyme disease recommendations of Centers for Disease Control (1990, 1995) (Fig. 3).

3. Results and discussions

A number of 1257 people arrived at the hospital with tick bites during 2017, especially in April - September period. Women were predominated, with the average age being 27 years.

A quarter of the patients were children. Of the total number of patients, 89 required additional investigations, raising suspicion of Lyme disease, 27 of them presented for clinical-biological and serological re-evaluation, and the other 1141 patients were evaluated by the doctor in the triage room, where they received recommendations and antibiotic recipe according to the guides, for Lyme disease prophylaxis.

The recommendations are based primarily on serology for Lyme disease, followed by local hygiene measures (cold water compresses, antibiotic prescription for prophylaxis or antihistamines) and careful consideration of possible side effects. Migraine erythema, inflammation at the site of bruising, fever and other systemic manifestations previously described were also observed. Regarding the way of hospitalization of the patients in which paraclinical investigations were carried out, the study reveals that 52 were admitted to the clinic for continuous hospitalization and 64 cases for day hospitalization.
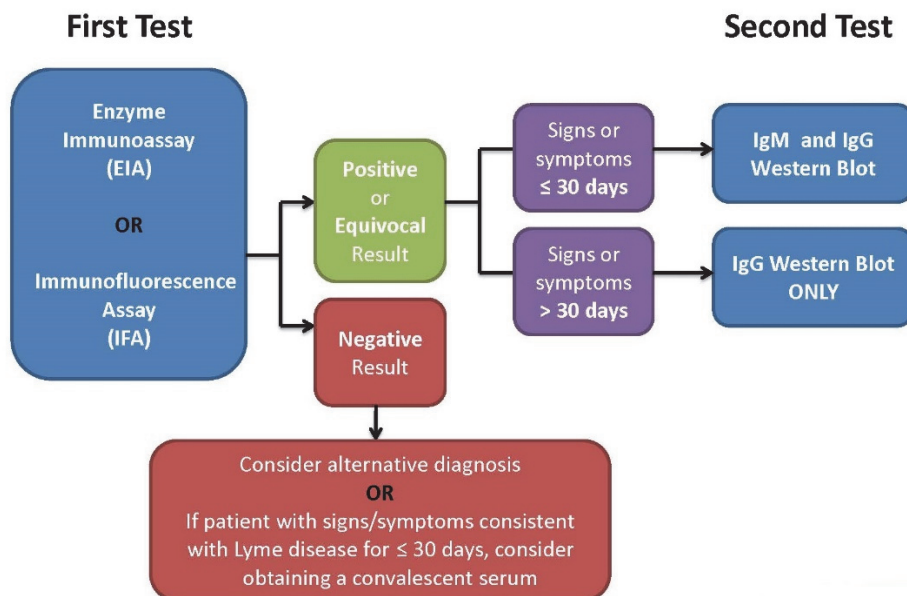

Fig. 3. Two-tiered testing for Lyme disease

The analysis of the specific incidence on gender tends in favor the females (62.71%) compared to the males (32.29%), the age group reveals that the 20-25 years predominated, but also patients over 60 years old (Fig. 4), and the one related to the environment of origin shows a higher proportion of urban patients (70.7%) with better addressability and responsiveness to signals.

Analyzing the distribution of cases by date of onset we noticed that in July were the most presentations in the clinic (22 cases - 19%), followed by June (18 cases - 15.5%), May and August (each one 17 cases - 14.6%). The explanation lies in the greater intensity of activity vectors in this period combined with professional and recreational activities in open space (Fig. 5). In all cases a tick bite was reported, and in terms of clinical manifestation, 76 patients accused erythematous lesions at the site of bruising, 7 patients had fever and 5 patients came with paresthesia of the limbs. Only one case of neuroborrhobia with multiple hospitalizations and good evolution under therapy was recorded. The number of cases confirmed by serology accounted for 17% of all analyzed cases, and in 65% of cases, the diagnosis was based only on clinical and anamnestic data, given that the serology had to be performed 21 days after the sting. In 18% of cases, the serological diagnosis was negative. This does not completely exclude the possibility of *Borrelia* infection. The number of days of hospitalization in confirmed and probable cases averaged eight days, minimum of one and maximum of 33 days. Antibiotic treatment was initiated for 72% of the confirmed and probable cases, the most commonly used in individual treatment being Doxycycline, followed by Amoxicillin and Ceftriaxone. The duration of antibiotic therapy was an average of 7 days. Evolution was favorable under antibiotic treatment. No death has been reported during the study period. Only 25 patients returned for further investigations at 21 days post-sting, in the rest of the cases we considered that Lyme disease serology was made in the private sanitary network and there were no special health problems.

4. Conclusions

Lyme disease is a multisystemic disease, having multiple clinical manifestations – cutaneous, musculoskeletal and neurological. Climate and behavioral changes regarding pet ownership, lead to increased addressability in the clinic of people who have been bitten by ticks.

Surveillance of Lyme disease, as well as other tick-borne diseases, is also a priority at European level. It is the most common infection whose etiological agent is transmitted through the tick, both in Europe and the United States.

Our study data is consistent with literature data. The increased share of female patients was observed, with the mean age being 27 years. At the same time, the incidence of the disease was significantly higher in the summer months.

In terms of diagnosis, serological tests should not be used as the sole diagnostic criteria but confirm the diagnosis in a strong clinical suspicion of Lyme disease. A negative serological result (ELISA or Western blotting) does not rule out the diagnosis of Lyme disease. Many patients with active or recent infection do not have Ac anti-*B. burgdorferi* detectable in a single biological sample.
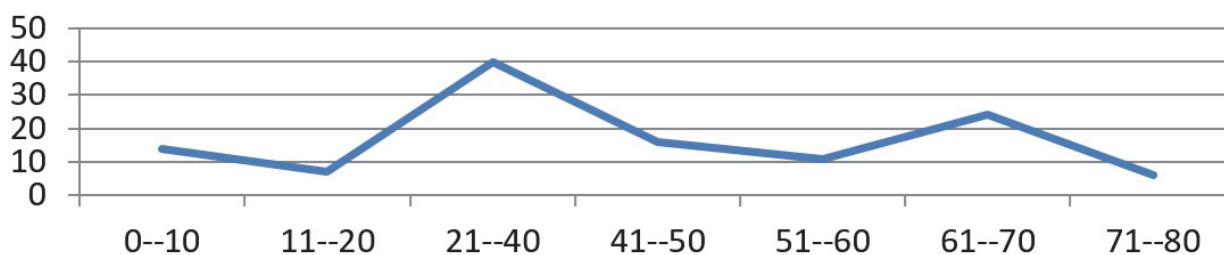

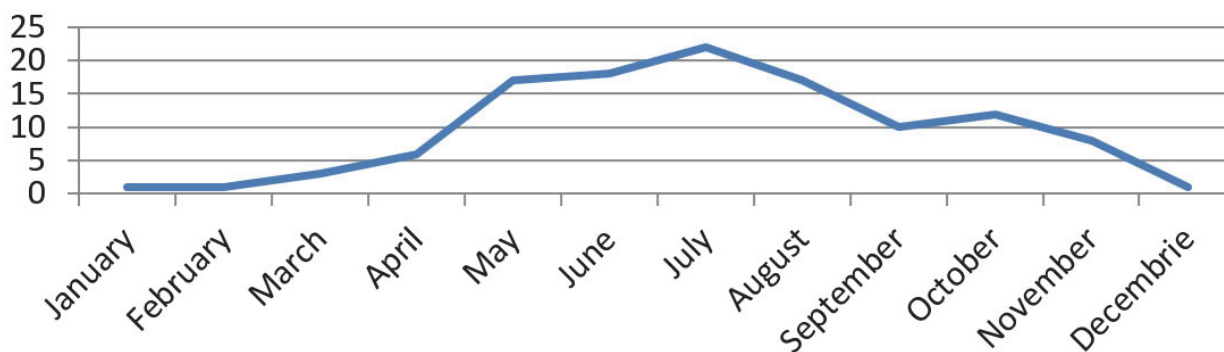**Fig. 4.** Distribution by age of patients investigated for Lyme disease

Fig. 5. Distribution of patients depending on the time of disease onset

On the other hand, a positive out-of-clinical outcome does not confirm the diagnosis. Due to the severity of its outcome and the means of transmission, Lyme borreliosis should be seen as an emerging disease that requires both the attention of health care providers and the general population.

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