

Survey of Lyme disease management in primary care in Poland

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A – Study Design, B – Data Collection, C – Statistical Analysis, D – Data Interpretation, E – Manuscript Preparation, F – Literature Search, G – Funds Collection

Summary Background. Lyme disease (LD) is the most frequent tick-borne human disease in the world. In patients with nonspecific or late-onset symptoms, LD is still a challenge for family physicians (FPs). Some studies which have been published on LD management by FPs revealed a deviation from the guideline recommendations and clinical practice.

Objectives. The aim of this study was to determine the common practice of FPs in the treatment of LD and whether these practices align with the guideline recommendations.

Material and methods. The study consisted of a survey of 54 FPs, including 46 women and 8 men at a mean age of 39.4 ± 10 years. An anonymous online questionnaire was used. The questionnaire was based on the guidelines for diagnosing and treating LD.

Results. Most of the respondents work in a city (63%) or a small town (22.2%). 96.3% of them practice in primary care. 70.4% of the FPs had experienced a tick bite and 3.7% of them developed LD. 22.2% reported Lyme disease in their family. All of the respondents indicated erythema migrans (EM) as a characteristic symptom of LD, but only 3.7% of them reported that they would send their patients for serological testing. 18.5% of FPs considered seropositivity to be an indication for prescribing antibiotics. 85.2% of FPs correctly classified whether other than EM signs and symptoms were related to LD. 85.2% of the respondents said they would report LD to the Polish Food Safety and Inspection Service.

Conclusions. Our study did not reveal a major deviation from the guideline recommendations. We found some FP misinterpretation, such as serology testing or antibiotherapy for asymptomatic patients. FPs should be trained at the clinical and epidemiological level. Up-to-date guidelines should be provided to FPs in order to limit inappropriate practices.

Key words: surveys and questionnaires, general practitioners, Lyme disease, knowledge.

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Background

Lyme disease (LD) is the most frequent tick-borne human disease in the world, with 85,000 cases reported annually [1]. In the United States from 1992 to 1998, the number of reported LD cases increased by 70% [2]. In Poland in 2017, there were 21,516 LD cases [3]. In 2013, the region of Podlaskie Voivodship had the highest incidence of LD (100.2/100,000) [4].

There is a higher risk of LD due to the extensive range of *Ixodes*-transmitted bacteria, presumably on account of bird migration, global climate warming and environmental conditions [5]. In Canada in 2014, a nationwide public awareness campaign was launched to combat the increasing risk of LD and to encourage preventative behavior regarding tick bites [6]. April through November is peak tick season. LD is a vector-borne, zoonotic infectious disease caused by the spirochete bacteria (*Borrelia burgdorferi*, *Borrelia afzelii*, *Borrelia garinii*) and transmitted by ticks of the *Ixodes* genus [7]. The predominance of the type of *Borrelia* bacteria depends on the region. *Ixodes scapularis* may also be infected with *Anaplasma phagocytophilum* or *Babesia microti*. The bite from an *I. scapularis* tick can cause LD, human granulocytic anaplasmosis and/or babesiosis as a single infection or as a coinfection [8].

Acute LD is characterized by erythema migrans (EM) – a distinctive symptom in about 80% of cases. Clinical manifestations

most often affect the skin, joints, nervous system and heart. Due to the unspecific nature of the symptoms in some cases, patients often undergo additional testing and are referred to specialists. The diagnosis and treatment of asymptomatic patients was reported to be common due to fears of a possible disseminated infection [9]. Another important aspect of pre-exposure prophylaxis for LD is media attention and potential pressure from a doctor's patients to prescribe them antibiotics as a prophylactic measure. If a patient presents with EM, laboratory testing is not necessary. In patients with non-EM symptoms after a tick bite or late disseminated symptoms, serological testing may be required for diagnosis and further treatment [9]. In the early stage of LD, serological tests have a low sensitivity [10]. Some studies have shown that differences in the management of LD were region-specific [11]. Currently, the best available method for preventing an infection with *B. burgdorferi* is to avoid exposure to ticks or to reduce the risk of infection using protective bright-colored clothing and repellents and by checking the entire skin for ticks [8]. Previous surveys of LD knowledge and practices among family physicians (FPs) have documented some differences between management and the published recommendations [2]. Most of the available studies were carried out in Canada or the United States. Despite the increasing number of patients visiting FPs with tick bites, there is a lack of research in this field in Europe. It is important to assess



FPs' knowledge about LD management and to provide up-to-date guidelines and epidemiological characteristics.

Objectives

The aim of this study is to determine the general beliefs and common practice of the FPs who treat/manage LD and whether these practices align with the guidelines of LD management.

Material and methods

Study design

An original, anonymous online questionnaire (comprising of 16 questions) was used to survey the respondents. The response rate was 36.2%. The questionnaire was based on the guidelines of the diagnosis and treatment of LD [12].

Participants

The study was conducted among a group of 54 family physicians in the Pomeranian Voivodeship of Poland: 46 women (85.2%) and 8 men (14.8%) at a mean age of 39.4 ± 10 years.

Statistical methods

The quantitative variables are presented in the form of numbers and percentages. All data were analyzed with Microsoft Excel 2013 software.

The study was conducted in accordance with the principles of Good Clinical Practice and the Declaration of Helsinki, with the approval of the local Bioethics Committee (approval No. NKEBN/232/08).

Results

The results of the study are presented in Table 1. Most of the respondents were female (85.2%, $n = 46$) and lived in the city (63%, $n = 34$). Of all the FPs, 96.3% ($n = 52$) work in primary care. More than 70% ($n = 38$) of the respondents had had a tick bite in the past and 3.7% ($n = 2$) of them developed LD symptoms. There were cases of LD in 22.2% ($n = 12$) of their families. All of the respondents knew that LD is caused by different types of *Borrelia*. All of the FPs (100%, $n = 54$) had observed asymptomatic patients after a tick bite. The respondents reported EM (96.3%, $n = 52$) and flu-like symptoms (85.2%, $n = 46$) as the initial symptoms of LD. More than 96% ($n = 52$) of the FPs had diagnosed LD due to the presence of EM. 18.5% ($n = 10$) of the respondents had treated asymptomatic patients with positive LD serological tests, while 48.1% of them ($n = 26$) had referred their patients for laboratory serological testing within 4–6 weeks of the tick bite. 85.2% ($n = 46$) of the respondents had reported LD cases to the sanitary-epidemiological department.

Question	Answer $n = 54$
Age	39.4 ± 10
Sex	female 85.2% (46) male 14.8% (8)
Location	city 63% (34) town 22.2% (12) other 14.8% (8)
Place of work	primary care 96.3% (52) ambulatory specialist care 3.7% (2) emergency Unit 3.7% (2)

Have you ever been bitten by a tick?	yes 70.4% (38) no 29.6% (16)
Have you ever had Lyme disease?	yes 3.7% (2) no 96.3% (52)
Were there any case of Lyme disease in your family?	yes 22.2% (12) no 77.8% (42)
Lyme disease is caused by the bacteria <i>Borrelia</i> and belong to the spirochetes	100% (54)
Patient visits a doctor on the day of a tick bite. He had completely removed the tick by himself and does not report any symptoms. What is the initial recommended approach?	observation of tick bite for a month 100% (54)
What may be the first symptom of Lyme disease?	erythema migrans 96.3% (52) flu-like symptoms 85.2% (46)
Is erythema migrans a characteristic symptom of Lyme disease?	yes 100% (54)
A tick bite and the occurrence of erythema migrans are sufficient for treatment	yes 96.3% (52) no, serologic test is requested 3.7% (2)
Positive serological tests without clinical symptoms...	...have no diagnostic value 81.5% (44) ...require treatment of Lyme disease 18.5% (10)
How long after a tick bite should serological tests be performed?	44.4% (24) there is no need for serological testing 48.1% (26) after 4–6 weeks other 7.5% (4)
Are there any requirements to report Lyme disease in Poland?	yes 85.2% (46) no 14.8% (8)
Is there any vaccine available for Lyme disease?	no 100% (54)

Discussion

Optimal management after tick bites may be complicated by the variety of pathogens transmitted by ticks and by the unspecific symptoms of LD in some patients. Ferrouillet et al. observed differences in the practice of LD treatment among FPs in different regions of Canada. The authors pointed to the clinical experience and possible under-reporting of LD cases as probable causes for this finding [11].

In the present study, primary care physicians generally scored high on the questionnaire. Most of the selected family practitioners (FP) had taken a course on Lyme disease which was organized by the local medical staff training center. More than 70% of FPs had experienced tick bites themselves and 3.7% of them had developed Lyme disease. While EM is a characteristic diagnostic feature of LD, it is not present in all cases. All of the respondents indicated EM as a characteristic symptom of LD. On the other hand, 3.7% of them stated that they would send patients for serological testing. In a study by Johnson et al., 50% of the patients reported visiting at least 7 FPs before being diagnosed of LD, which delayed the correct diagnosis and treatment [13]. In the current study, it was observed that the majority of the respondents (85.2%) were able to correctly determine whether the other signs and symptoms – apart from EM – were related to LD. The sensitivity of serological testing in early-stage LD has been reported to be low (40%) [2]. Therefore, a negative test should not eliminate a diagnosis of LD in patients with objective clinical symptoms like EM [2]. The respondents rightfully continued to monitor their tick-bite patients for LD symptoms for a month after the bite.

It was found that 18.5% of FPs considered seropositivity for LD to be an indication for the use of antibiotics. This can lead to

a false positive diagnosis. Lieber M'bomeyo et al. reported that 50% of FPs believed that serological confirmation in addition to EM is required for an LD diagnosis [14]. Magri et al. reported that 50% of FPs did not know that EM alone can be sufficient to diagnose LD [2]. Approximately 13% of FPs are likely to prescribe a prophylactic dose of antibiotics even for an asymptomatic tick-bite patient, whereas 28.3% would test the patient for LD [2]. Henry et al. found that only 58.3% of respondents prescribed antibiotics in patients with EM [9]. On the other hand, Johnson et al. reported that most of the patients complained of LD symptoms lasting at least six months despite treatment with antibiotics [13]. In Quebec, Canada, between 10% and 15% of ticks are infected with *B. burgdorferi* [11]. Routine use of antibiotics for prophylaxis of LD after a tick bite is not recommended. The conditions under which antibiotic prophylaxis may be beneficial are limited and its prophylactic capacity has not been demonstrated for other tick-borne diseases [15]. The advantage of antibiotic treatment is limited by the low risk of LD infection following a single tick bite [15]. A meta-analysis of four trials by Warshafsky et al. revealed that prophylactic treatment after a tick bite would prevent 1 case of LD for every 50 patients [16]. It is worth pointing out that prophylaxis is associated with side effects, antibiotic resistance and stress in patients due to delayed diagnosis and treatment of the underlying cause of the patient's symptoms.

A survey by Brett et al. found that 31% of participating US healthcare providers (family doctors, dermatologists and nurses) had prescribed prophylaxis for LD in the previous year [17]. Magri et al. found that 44.8% of respondents reported treating patients for a possible LD diagnosis solely because of the patient's insistence [2]. A survey of Connecticut primary care physicians found that only 2.1% of them had diagnosed and treated patients with chronic LD in the past 3 years, while 49.8% of the respondents did not even believe in the existence of chronic LD [18].

In Poland, it is mandatory for clinicians to report cases of LD as with other infectious diseases. The respondents adhered to this in 85.2% of cases, according to their responses. Generally, epidemiological reports are important for a multitude of reasons, since they play a key role in the planning and evaluation of prevention and control programs and in the provision of appropriate medical management.

In Poland, vaccines against LD are not available. FPs scored 100% on this question. In the United States, the LYMERix vaccine was withdrawn from the market in February 2002 because of suggestions of autoimmune responses to the vaccine. A vaccine

efficacy of 100% was reported in the asymptomatic disease state and an efficacy of 76% in the symptomatic disease state [19]. However, tick-borne encephalitis vaccines (TBE) are available in Poland. In a study conducted by Nitsch-Osuch et al. among 5,658 pediatric patients, only 236 (4%) of them were vaccinated against TBE [20]. As mentioned before, the best method currently available for preventing LD is to prevent tick bites. In Canada, LD is increasingly becoming a health concern; hence, even municipal authorities are involved in facilitating preventative interventions to reduce the risk of developing LD [21]. A study by Aenishaenslin et al. reported that less than 50% of the respondents in Canada adopted appropriate preventative measures against tick bites, including skin checks and the use of protective clothing or repellents when visiting tick-infested areas [6].

Strengths and limitations of the study

This study adds valuable information to a field lacking knowledge about family doctors' management and treatment of LD. A thorough and advanced statistical analysis of the data was limited by the small sample size, which consequently did not allow for generalization of the findings. Similarly, the simplistic design of the questionnaire inhibited the proper collection of data that would be required for advanced statistical analysis which could be used to draw out significant relationships. Further research to deduce relationships of statistical significance has been planned, taking into consideration the deficits of the current research methodology.

Conclusions

This study found a lack of any major deviation from the guideline recommendations for LD patients. However, it showed some misinterpretation by FPs in terms of serological testing or antibiotherapy for asymptomatic patients. FPs should be trained at the clinical level for LD management and on an epidemiological level for those in high-risk areas. Also, up-to-date guidelines should be provided to FPs in order to limit inappropriate practices in LD cases. Follow-up studies may be carried out to assess the impact of education on the knowledge of LD.

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Conflicts of interest: The authors declare no conflicts of interest.

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