

## Streszczenie w języku angielskim

Lyme disease (LD) is an illness primarily found in the regions of Eurasia and North America, transmitted by ticks, and caused by the *Borrelia burgdorferi* sensu lato spirochetes. In Europe, the disease is most commonly caused by the genospecies *B. garinii*, *B. afzelii*, and *B. burgdorferi* sensu stricto. Its spread is dynamically increasing, linked to climate changes that favor the expansion of ticks. The disease can take various forms, and its diagnosis is often challenging due to the diverse clinical presentation and frequently nonspecific symptoms.

The incubation period of Lyme disease typically ranges from 3 to 30 days, although symptoms may also appear several months after infection. In the early stage of the disease a rash known as erythema migrans may appear. The infection can then progress to a disseminated stage, with symptoms involving the nervous system, musculoskeletal system, or heart. Clinical diagnosis of Lyme disease is supported by laboratory test results. An exception is erythema migrans, whose presence on the skin allows for diagnosis based on the clinical picture. Diagnostic methods used in Lyme disease include enzyme immunoassays (EIA), Western blot (WB), and to a lesser extent, molecular biology techniques. These methods vary in sensitivity, specificity, and cost. Limitations of the conventional two-tiered diagnostic method (CTTT), which involves first-tier EIA test followed by a WB test in the second step, have led to the introduction of a modified two-tiered testing method (MTTT), utilizing tests with recombinant antigens (VlsE and C6). Measuring the titers of anti-VlsE and anti-C6 antibodies has also shown promise in monitoring the effectiveness of LB treatment in adults.

In the context of the aforementioned challenges, current research was conducted to understand the effectiveness of prevention and to refine the diagnostics of Lyme disease in children. The aim of the study was to assess the knowledge, attitudes, and preventive practices among respondents from northeastern Poland regarding Lyme disease, and to identify factors influencing people's attitudes and practices in the prevention of tick-borne diseases. Additionally, the commonly accepted two-tiered diagnostic algorithm for LB using EIA and WB tests was compared with the proposed alternative algorithm using EIA tests detecting recombinant antigens (VlsE and C6), also considering the application of these tests in monitoring the effectiveness of LB treatment.

In the first original study of the series, the knowledge, attitudes, and preventive practices of residents in an endemic area in Poland were evaluated. A total of 406 participants from northeastern Poland were included in the study. About 41% of respondents had been bitten by a tick in the past, 16% within the last year, and 31% confirmed their children had been bitten. Participants frequently used the Internet and doctors' advice. Over half of the respondents

considered diseases transmitted by ticks to be at least as dangerous as cardiovascular diseases or cancers. The vast majority of surveyed people applied correct methods of protection against tick bites and rightly did not expect post-exposure antibiotic prophylaxis, which was prescribed only to 12% of individuals after a tick bite. However, significant gaps in knowledge and numerous misconceptions about the disease were revealed. Nearly one in four respondents incorrectly identified a tick in an illustration. As many as 20% believed in vertical transmission of Lyme disease from mother to child, and almost 60% thought that Lyme disease is incurable. Over half of the respondents feared fragments of the tick remaining in the skin after its removal, while believing that the tick should not be removed independently. Just under half of the respondents were positively inclined towards vaccinations against Tick-Borne Encephalitis (TBE). Currently, there is no available and registered vaccine against LB, so in our study, we asked questions evaluating the attitude towards vaccination against another tick-borne disease, TBE. Efforts to develop a vaccine against LB are ongoing, and the success of the TBE vaccine suggests that it may be an effective approach to reducing the incidence of LB. Moreover, our study established that a recent tick bite was associated with a higher level of knowledge, correct preventive behavior, and a positive attitude towards the TBE vaccine.

The second study focused on improving the diagnostics of LB, with an emphasis on modifications in the two-tiered serological test. A total of 354 children were examined, of which 70 were included in the analysis (49 with erythema migrans and 21 with neuroborreliosis). The use of recombinant antigens, such as VlsE and C6, appears to be a promising alternative, especially in the early stages of the disease. The study conducted on children with symptoms suggestive of LB highlights the potential usefulness of the C6 antigen as a diagnostic tool. The presented results of the antibody analysis and their changes during treatment shed light on the potential applications of these tests in monitoring the effectiveness of therapy. However, it is important to interpret the results cautiously in a clinical context, as antibodies can be detected for a long time after successful treatment of the infection.

The following conclusions were formulated:

1. Respondents living in northeastern Poland consider diseases transmitted by ticks as a significant health threat to themselves and their families, comparable to cancer and cardiovascular diseases.
2. In most cases, respondents applied recommended methods to reduce exposure to tick bites and to prevent Lyme disease. In a small percentage, prophylactic antibiotic therapy was prescribed for respondents or their children.

3. Most respondents obtained their knowledge about tick-borne diseases from the Internet and from their doctors, and these sources should be utilized to expand the population's knowledge about these diseases.
4. Most children meeting the clinical criteria for the diagnosis of Lyme disease, due to the obvious picture of erythema migrans, were adequately treated by general practitioners. Despite this, these children were referred to specialist clinics for further care.
5. Some children with erythema migrans have negative serological test results for Lyme disease despite the use of tests with recombinant antigens. Clinical diagnosis at this stage of the disease should remain the gold standard of diagnostics and the basis for initiating treatment.
6. A significant decrease in the titer of antibodies against the recombinant VlsE protein during the treatment of erythema migrans and a downward trend in neuroborreliosis were observed, which may indicate the potential of using these antibodies to monitor the treatment of Lyme disease in children.