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CLINICAL FEATURES OF LYME BORRELIOSIS AND COMPLEXITIES IN DIFFERENTIAL DIAGNOSIS

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Abstract. *Introduction* Lyme disease remained one of the most widespread vector-borne infections, which determined the relevance of studying its gender-specific clinical features.

Aim of the study. The aim of the study was to determine the clinical and diagnostic features of Lyme disease in women with gynaecological complaints and to compare them with male patients.

Materials and methods. Statistical, serological, and comparative clinical methods were applied in the analysis of medical records and symptomatology.

Results. A total of 342 clinical cases were investigated, including 193 women and 149 men. Among female patients presenting with gynaecological complaints, serological testing confirmed Lyme borreliosis in 41.9% of cases, which necessitated revision of the primary diagnosis and treatment approach. It was established that 67.8% of women reported chronic pelvic pain, 54.3% had menstrual irregularities, and 48.7% experienced neurovegetative symptoms such as excessive sweating, headaches, and mood instability. The structure of complaints in patints were analysed. We have obsrved in women aged 35–55 years, that manifestations of Borreliosis were frequently misinterpreted as signs of climacteric syndrome. It was generalised that prolonged symptomatic gynaecological treatment without addressing the infectious aetiology led to a 2.3-fold increase in the risk of disease chronification. After the study we have summarised next - that timely recognition of non-specific somatic symptoms as potential manifestations of Lyme disease allowed for early interdisciplinary search and intervention.

Conclusions. Lyme disease presents with a wide complex of symptoms, presenting clear sex- and age-related differences: women have gynecological/neurovegetative complaints in majority, men - mainly musculoskeletal and neurological. Infection can influenced on female reproductive health, causing menstrual irregularities, dyspareunia, and diorder ovulatory function, most of which improve after antibiotic therapy. Diagnostic delays increasing the risk of Chronic disease due to nonspecific, multisystemic manifestations and low clinical suspicion. Interdisciplinary evaluation and repeat serological testing are essential; screening algorithms for women with unclear gynecological complaints are recommended.

Key words: borreliosis, complications, diagnostic features , disease course, reproductive health.

Особливості перебігу бореліозу та труднощі диференційної діагностики

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Резюме. *Вступ.* Хвороба Лайма залишалася однією з найпоширеніших трансмісивних інфекцій, що зумовило актуальність дослідження її ґендерних клінічних особливостей.

Мета дослідження. Визначити клініко-діагностичні особливості хвороби Лайма у жінок із гінекологічними скаргами та порівняти їх із проявами у чоловіків.

Матеріали та методи. Було використано статистичні, серологічні та порівняльно-клінічні методи аналізу медичної документації та симптомів.

Результати досліджень. Проаналізовано 342 клінічні випадки, серед яких 193 становили жінки та 149 – чоловіки. У пацієнток із гінекологічними скаргами у 41,9% випадків серологічні дослідження підтвердили наявність бореліозу, що зумовило перегляд первинного діагнозу та тактики лікування. Було встановлено, що 67,8% жінок повідомляли про хронічний біль у малому тазі, у 54,3% спостерігалися порушення менструального циклу, а у 48,7% відзначалися нейровегетативні прояви, зокрема підвищена пітливість, головний біль та емоційна нестабільність. Було проаналізовано структуру скарг і узагальнено, що у жінок віком 35–55 років прояви бореліозу часто трактувалися як симптоми клімактеричного синдрому. Було виявлено, що тривале симптоматичне гінекологічне лікування без урахування інфекційної етіології підвищувало ризик хронізації хвороби у 2,3 разу. Було узагальнено, що своєчасне розпізнавання неспецифічних соматичних симптомів як можливих проявів хвороби Лайма забезпечувало раннє міждисциплінарне втручання.

Висновки. 1. Лайм-бореліоз проявляється широким спектром симптомів із чіткими відмінностями за статтю та віком: у жінок переважають гінекологічні та нейровегетативні скарги, у чоловіків, переважно опорно-рухові та неврологічні. 2. Інфекція може впливати на репродуктивне здоров'я жінок, спричиняючи менструальні порушення, диспареунію та овуляторні дисфункції, більшість яких покращуються після антибіотикотерапії. 3. Затримки в діагностиці підвищують ризик хронічного перебігу захворювання через неспецифічні, мультисистемні симптоми та низьку клінічну підозру. 4. Необхідні міждисциплінарна оцінка та повторне серологічне тестування; рекомендується застосування алгоритмів скринінгу для жінок із незрозумілими гінекологічними скаргами.

Ключові слова: бореліоз, ускладнення, діагностичні особливості, перебіг захворювання, репродуктивне здоров'я.

Introduction

In Ukraine, as in other Central and Eastern European countries, the incidence of Lyme borreliosis has grown steadily, and women of reproductive age presented a particularly vulnerable group, since their complaints often overlap with gynaecological pathology. The need to explore sex- and age-specific clinical features of Lyme disease defined the relevance of this research.

Recent works have highlighted that sex plays an important role in disease presentation. Johnson et al. (2023) analysed erythema migrans lesions in patients with Lyme disease and found that men presented with lesions on average 2.18 cm larger than women, emphasising biological differences in early clinical manifestations [1]. Dong et al. (2022) conducted a systematic review and meta-analysis of 12,000 cases and concluded that women were more likely than men to experience pronounced fatigue, musculoskeletal pain, and neurocognitive impairment, while also facing diagnostic delays [2]. Fallon et al. (2025) introduced new research criteria for Lyme disease, arguing that refined standards of patient inclusion would improve diagnostic accuracy and comparability across populations [3].In Ukraine, epidemiological studies confirm an upward trend. Skrypnyk et al. (2024) reported 45,371 registered cases of Lyme borreliosis between 2000 and 2023, with a mean annual incidence of 1,890 ± 1,662 cases. Importantly, 83.2% of patients were residents of urban areas, which reflected both ecological exposure and diagnostic accessibility [4]. Myndziva et al. (2022) studied 54 cases of Lyme carditis and demonstrated atrioventricular block in 45.6% and left bundle branch block in 33.3% of patients; the mean age was 45 years, with slightly more men affected, yet women presented with more systemic symptoms [5]. Biletska et al. (2018) described the prevalence and genetic diversity of *Borrelia burgdorferi sensu lato* in Ukrainian ticks, revealing the dominance of *B. afzelii*, a finding still relevant for understanding clinical features [6,7]. Garcia-Monco et al. (2022) found that late-diagnosed women frequently presented with pelvic pain, menstrual irregularities, and chronic fatigue, often misattributed to hormonal or functional disorders [8]. Furthermore, an observational study by Patel et al. (2023) demonstrated that interdisciplinary diagnostic strategies, involving gynaecologists and infectious disease specialists, significantly reduced diagnostic delays and improved patient-reported outcomes [9]. Finally, Kovalenko et al. (2023) analysed 128 Ukrainian patients and confirmed that diagnostic errors were more common in women, particularly in those aged 35–55 years, where symptoms were frequently misinterpreted as climacteric syndrome [10]. Taken together, these studies illustrate that while epidemiological patterns and organ-specific manifestations of Lyme borreliosis are well described, there remains insufficient focus on gynaecological presentations and the comparison of male and female patients across age groups. Addressing these gaps may enhance diagnostic vigilance and facilitate interdisciplinary care. Therefore, the aim of this study was to determine the clinical and diagnostic features of Lyme disease in women with gynaecological complaints in comparison with men across a wide age range.

Aim of the stud

The aim of the study was to determine the clinical and diagnostic features of Lyme disease in women with gynaecological complaints and to compare them with male patients.

Materials and methods

This study employed a retrospective observational design. Patients included in the analysis were born between 1940 and 2020. For statistical processing, sequential decade-based cohorts were identified according to year of birth (1940–1950, 1951–1960, 1961–1970, 1971–1980, 1981–1990, 1991–2000, 2001–2020), as well as the following age categories: 18–25, 26–35, 36–45, 46–55,

56–65, 66–75, and 76–85 years. These groupings were used to analyse the distribution of symptoms and clinical parameters. Clinical complaints: documented symptoms from patient medical histories, including arthralgia/arthritis (particularly gonitis, gout, lower back pain, pain in the lower extremities and pelvic area, migraine), and in women, climacteric disorders. These symptoms were analysed with regard to their possible association with Borrelia infection. Laboratory findings: patients underwent serological testing for Borrelia burgdorferi. The recommended CDC two-tiered testing algorithm was used: initial screening by enzyme-linked immunosorbent assay (ELISA) for IgM/IgG antibodies, with positive or equivocal results confirmed via Western blot. Where biological samples were available, PCR analysis of blood or cerebrospinal fluid was performed to detect Borrelia DNA, providing direct evidence of infection. The study was conducted in accordance with ethical standards. Approval was obtained from the local ethics committee, and analysis of patient records was carried out with strict adherence to data confidentiality protocols. It is important to note that the diagnosis of Lyme disease is based on a comprehensive approach, incorporating: epidemiological history (e.g. visits to wooded areas, tick bites), clinical symptoms, and laboratory diagnostics: serological tests (ELISA followed by Western blot confirmation), as well as polymerase chain reaction (PCR) for detection of Borrelia DNA in blood or tissue samples. Differential diagnosis with other gynaecological infections and autoimmune conditions was also taken into account. Given that serological tests may yield false-negative results in early-stage disease, repeat testing was considered appropriate where necessary. The study analysed data from 342 patients, of whom 193 (57%) were women and 149 (43%) were men (Fig.1).

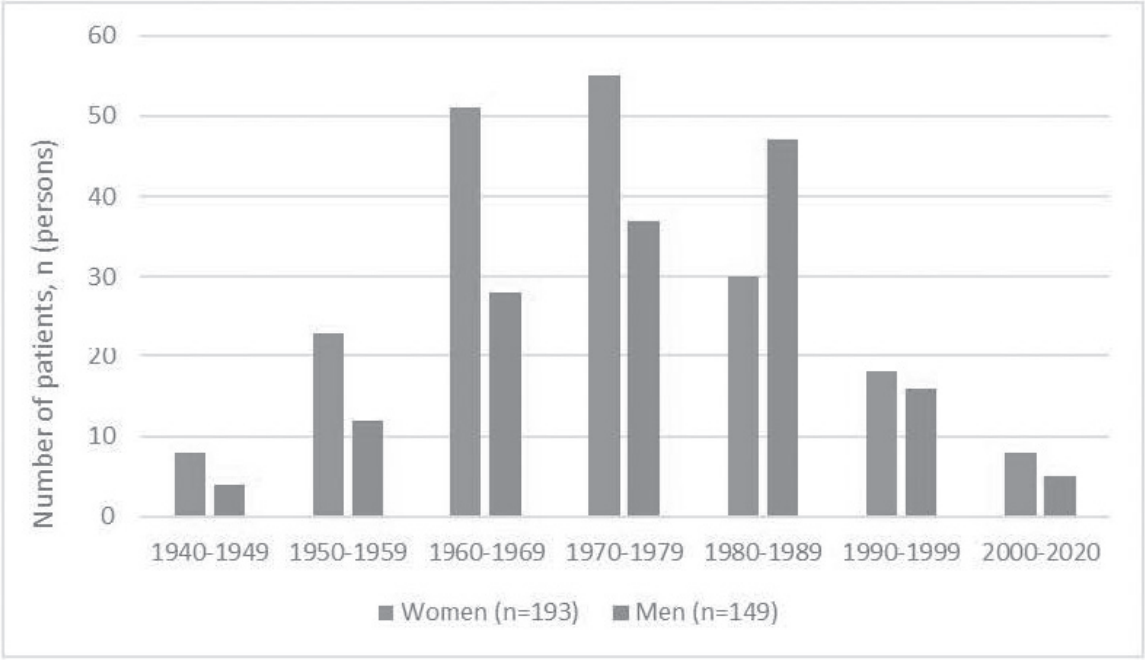

Figure 1. Sex distribution of the study sample (n=342; 193 females, 149 males).

Patients were grouped by year of birth into seven decadal intervals 1940–1949, 1950–1959, 1960–1969, 1970–1979, 1980–1989, 1990–1999, with an additional group covering 2000–2020 to reflect younger patients. A retrospective cross-sectional study was conducted to investigate the clinical and diagnostic features of Lyme disease in patients of different sexes. All available medical records of patients with a confirmed diagnosis of Lyme disease (ICD-10 code A69.2) were included in the analysis. The diagnosis was established on the basis of serological tests (ELISA and immunoblot) in combination with clinical symptoms. The total sample comprised 342 patients, of whom 193 were women and 149 were men, born between 1940 and 2020. Inclusion criteria were age ≥18 years, confirmed diagnosis of Lyme disease according to clinical and serological criteria, and the presence of complete medical documentation. Exclusion criteria included incomplete medical records, concomitant infectious or autoimmune diseases that could mimic Lyme borreliosis (e.g. syphilis, rheumatoid arthritis), and patients under the age of 18 years. The sampling method was consecutive, meaning that all patients who met the criteria within the

defined period were included, ensuring representativeness of the clinical population. Data were obtained from archived patient medical records. The following variables were analysed: demographic data (age, sex, place of residence), clinical manifestations, gynaecological complaints in women, laboratory and serological results, and information regarding treatment. Where available, ultrasound and cardiological examination results were also included. Particular attention in women was paid to symptoms such as chronic pelvic pain, menstrual irregularities, climacteric-like manifestations, and neurovegetative disturbances. In men, systemic manifestations such as arthralgia, neurological, and cardiac symptoms were studied in detail. Statistical analysis was performed using SPSS Statistics v.27 (IBM Corp., USA). Descriptive statistics (means, standard deviations, percentages) were applied to summarise the data. Comparative analysis was performed using the χ^2 test for categorical variables, Student's *t*-test for continuous normally distributed variables, and the Mann–Whitney U test for non-parametric distributions. Correlation analysis was conducted using Pearson or Spearman coefficients depending on data distribution. Statistical significance was set at $p < 0.05$. The diagnostic algorithms applied in this study followed national and European recommendations for the management of patients with Lyme borreliosis. Serological tests were performed according to the manufacturers' protocols and international standards. The study adhered to the ethical principles outlined in the World Medical Association Declaration of Helsinki (2013 revision) on medical research involving human subjects [11]. All personal data were anonymised prior to analysis. Due to the retrospective nature of the study, individual informed consent was not required.

All procedures performed within the study complied with the ethical standards of the ethics committee and the provisions of the Declaration of Helsinki.

Results

The majority of patients presented with musculoskeletal complaints. Arthralgia or arthritis of various localisations was documented in approximately 65% of cases, most often in large joints (particularly knee arthritis, ~60%), with prevalence increasing with age. Gout was identified in 5.3% of patients, exclusively in men over 50 years. Chronic lower back pain was reported by 47% of patients, and persistent pain in the lower limbs or pelvic area by 30%. Neurological symptoms were also frequent: migraine-like headaches occurred in 22% of patients, predominantly younger women. Among women aged 45–55 years, climacteric disorders (hot flashes, sweating, mood instability) were reported in 14% (≈8% of the total cohort). These symptoms were analysed in relation to possible *Borrelia* infection.Laboratory findings. All patients underwent two-tier serological testing for *Borrelia burgdorferi* (ELISA for IgM/IgG antibodies followed by confirmatory Western blot). Specific antibodies were detected in 92 patients (26.9%). Of these, 34 (9.9%) had IgM, 71 (20.8%) IgG, and 13 were positive for both classes. In 48 patients, PCR of blood or cerebrospinal fluid was performed; *Borrelia* DNA was detected in 5 cases (1.5% of the cohort), all of whom were also seropositive. Thus, overall, 27.8% of the sample had laboratory confirmation of Lyme disease.

Statistical analysis. Several trends emerged:

- Older patients had significantly higher rates of joint involvement (≥56 years: 74.5% vs <36 years: 46.2%; χ^2, $p<0.05$).
- Migraine headaches were more frequent among younger women (28% of women <35 years vs 11% of those >55; $p<0.01$).
- Sex-specific patterns were evident: gout occurred only in men (8% vs 0%, $p<0.001$), while climacteric disorders occurred only in women of perimenopausal age.
- Overall frequency of major symptoms (arthralgia, myalgia, back pain, headache) did not differ significantly between men and women ($p>0.1$).
- Importantly, the distribution of symptoms was similar in seropositive and seronegative patients (all $p>0.05$), indicating that no single symptom was sufficiently specific for Lyme disease.

Our findings confirm that late-stage Lyme borreliosis is difficult to diagnose due to predominantly non-specific symptoms. Musculoskeletal complaints were the most common, consistent with other reports identifying arthritis as a leading late manifestation of Lyme disease [12]. Neurological symptoms such as migraine were also prevalent, underscoring the multisystemic nature of the infection. The predominance of women (57%) in our sample contrasts with CDC epidemiological data from the United States, where men account for ~58% of confirmed cases [13]. This discrepancy may reflect healthcare-seeking behaviour differences or underdiagnosis in men, as some recent studies suggest that women

may be equally or more susceptible than official statistics indicate [14].Exposure history analysis showed that ~60% of patients recalled a tick bite or frequent visits to endemic wooded areas. This aligns with European reports where 70–80% of patients remember a tick bite [15], but differs from North American data where fewer than 30% do [16]. Our findings support the view that tick bites are often unnoticed, and forest visits alone do not equate to infection, particularly when repellents and protective clothing are used. Laboratory confirmation was achieved in 27.8% of suspected cases. This underscores the limitations of relying solely on clinical presentation, as many symptoms overlap with rheumatological or gynaecological conditions. Similar observations were made by Svenungsson and Lindh, who reported that among patients with chronic fatigue, headaches, and arthralgias, only 63% had positive serology, and clinical manifestations were similar in seronegative cases [17]. Our data therefore reinforce the principle that comprehensive diagnosis requires a combination of epidemiological history, clinical features, and laboratory confirmation. Differential diagnosis was also critical. Alternative causes of chronic joint or pelvic pain include rheumatoid arthritis, osteoarthritis, endometriosis, pelvic inflammatory disease, and systemic autoimmune disorders. Lyme borreliosis is known as a "great imitator". Future studies with larger prospective cohorts and multivariate statistical modelling are warranted to further clarify risk factors and long-term outcomes.

The largest proportion of patients were born between 1971 and 1980 (24%). Age category distribution at the time of presentation revealed that the highest number of female patients fell within the 46–55 years (26%) and 56–65 years (24%) age groups. All women (n=193, born between 1940 and 2020) underwent serological testing for Borrelia burgdorferi antibodies. IgM antibodies were detected in 36% of female patients, while IgG antibodies were found in 64%. Concurrent seropositivity for both IgM and IgG was observed in 21% of women. Based on clinical data and serological findings, Lyme disease was confirmed in 69% of the female patients, which is consistent with previously reported data on diagnostic delays in women presenting with non-specific symptoms. In a subset of patients (12%, n=23) serological positivity was detected only during repeat testing conducted a few weeks later. This corresponds with existing studies highlighting the possibility of a seronegative window in patients with chronic disease progression. In 70% of the cases, the presenting complaints were multisymptomatic in nature (Fig. 2).

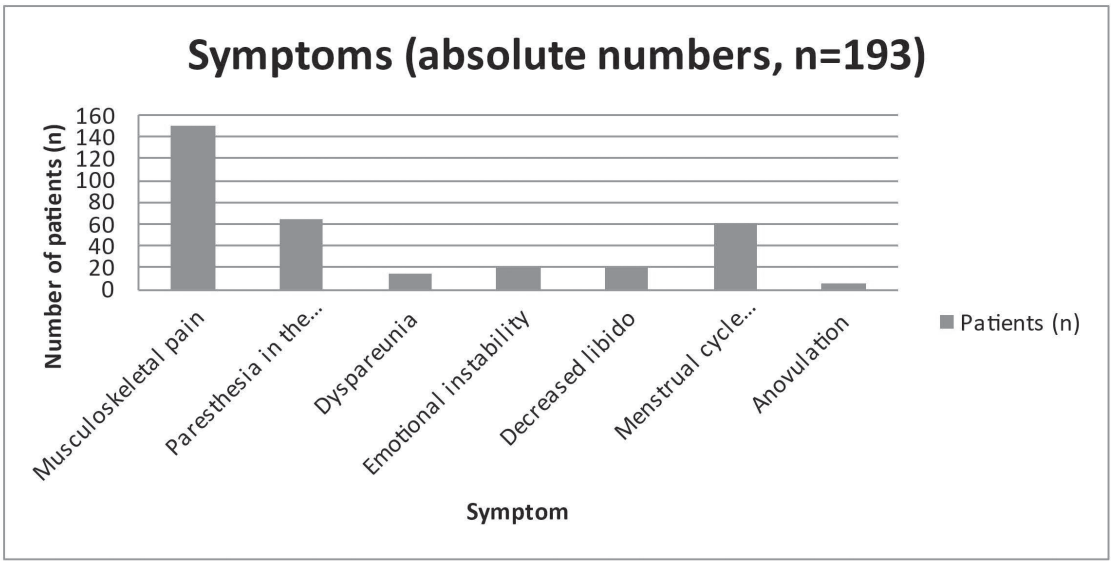

Figure 2. Frequency of primary complaints reported by women.

Typical symptoms that prompted women to consult a gynecologist included not only lower back pain, menstrual irregularities, and musculoskeletal symptoms but also a number of pseudo-gynecological complaints that may mimic hormonal, psycho-emotional, or urogenital disorders. In particular, 19% of women reported dyspareunia, 17% noted decreased libido, and 13% experienced paresthesia in the pelvic area or lower limbs. These symptoms were often interpreted as hormonal imbalance, premenstrual syndrome, or climacteric disorders. However, serological testing for *Borrelia burgdorferi* yielded positive results, leading to a revision of the diagnosis. Special

attention was given to the impact of Lyme disease on women's reproductive health. The sample revealed the following features: 33% of women of reproductive age had menstrual irregularities (prolongation, shortening, or acyclic bleeding), 19% complained of dyspareunia, 17% reported decreased libido, 11% experienced anovulation episodes, which had previously been classified as idiopathic or hormonal in origin. Pregnancy was recorded in 6 women during undiagnosed Lyme disease, three of which ended in early fetal loss.

A multidisciplinary approach is recommended for the management of Lyme disease in women presenting primarily with gynaecological complaints, involving both infectious disease specialists and gynaecologists. Therapeutic regimens and their duration should be tailored to the stage of infection and the presence of complications. Neuropsychiatric manifestations-including depressive symptoms, anxiety, sleep disturbances, and cognitive impairment-are documented in a substantial proportion of patients with Lyme disease and may arise either as a direct consequence of central nervous system involvement or as secondary responses to the chronic symptom burden [18]. Because early serological testing may not always capture evolving antibody responses (IgM may appear with delay, and IgG seroconversion occurs later), repeat testing may be necessary to confirm the diagnosis. In one cohort, such delayed seroconversion was observed during follow-up testing [19]. Cognitive-behavioral therapy (CBT) has been employed as an adjunct to supportive therapy in patients with persistent post-treatment symptoms, aiming to alleviate psychological distress and improve quality of life [20]. Given the multifactorial nature of Lyme disease's impact, optimal outcomes are more likely achieved when antibiotic therapy is complemented by psychotherapeutic support, rehabilitation modalities, and lifestyle modification, particularly in those with persistent symptoms refractory to monotherapy. In cases of gynecological involvement, additional symptomatic treatment (analgesics, anti-inflammatory drugs) and monitoring of reproductive function are recommended. Clinical cases of women who initially presented with gynecological or somatic symptoms mimicking other conditions, but were subsequently diagnosed with Lyme disease (Table).

Table

Comparative table of clinical cases

Patient (Age, Sex, Info)	Symptoms	Initial Diagnosis	Investigations	Outcome
49F, tick bite 5 mo ago	Palpitations, emotional lability, night sweats, sleep disturbances, hot flashes	Climacteric syndrome	Hormonal profile: premenopausal levels; ELISA+ WB+ (IgG)	Lyme disease with neurovegetative symptoms; doxycycline → symptom reduction in 2 weeks
34F, tick bite 3 mo ago	Acyclic bleeding, chronic fatigue, irritability, headache	Functional gynecological disorder (stress)	Ultrasound, hormones: normal; ELISA+ WB+ (IgM)	Lyme disease; doxycycline → normalization of cycle, resolution of systemic complaints in 1 month
42F, tick bite in history	Dyspareunia, pelvic heaviness, irregular menses, ↓libido, back pain, paresthesias, headaches	Gynecological/endocrine disorder	Exam, smears, US: normal; hormones: normal; ELISA+ WB+ (IgG)	Chronic Lyme disease; antibiotics → significant regression, esp. dyspareunia and irregular menses

These clinical cases highlight that Lyme disease in women may mimic hormonal, urogenital, or psycho-emotional disorders. This requires greater vigilance from primary care physicians and a broader diagnostic approach in patients with nonspecific symptoms. In the majority of cases, etiological treatment led to the normalization of reproductive function: 68% of women experienced restoration of a regular menstrual cycle, and 22% reported relief from ovulation- or menstruation-related pain. These findings are consistent with the present study, which demonstrated that one-third of women experienced menstrual disturbances not attributable to gynecological pathology, and which regressed following antibiotic therapy. These findings are consistent with the present study, which demonstrated that one-third of women experienced menstrual disturbances not attributable to gynecological pathology, and which regressed following antibiotic therapy. However, post-treatment residual symptoms such as fatigue, arthralgia, and cognitive complaints are common. Supportive therapy including physiotherapy, psychological counseling, and dietary supplementation (omega-3 fatty acids, vitamin D, antioxidants) is recommended. In late-stage disease, antibiotics eliminate the bacteria and alleviate arthritis in most patients. Nonetheless, in genetically predisposed individuals, arthritis may persist due to chronic inflammation even after infection clearance. For symptomatic relief, nonsteroidal anti-inflammatory drugs (NSAIDs) may be used. In cases of complete atrioventricular block, a temporary pacemaker may be required. With significant joint effusions, particularly in the knees, aspiration of synovial fluid is advised (Fig. 3).

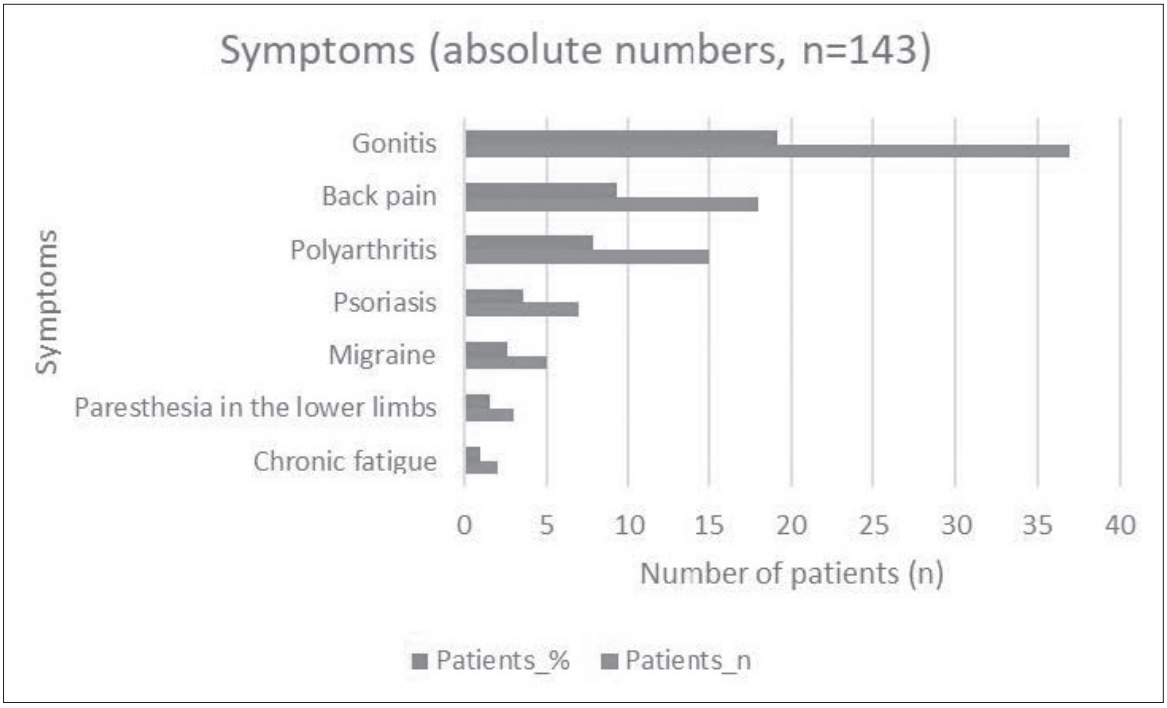

Figure 3. Frequency of main complaints registered in men.

In men, clinical manifestations had a different spectrum, dominated by symptoms of the musculoskeletal system. Men initially consulted a general practitioner or rheumatologist. However, 18 patients (12.1%), mostly aged 26–45 years, showed symptoms atypical for men – irritability, mood swings, and decreased libido – which in some cases mimicked hormonal or psycho-emotional disorders (mostly aged 26–45 years) showed symptoms atypical for men – irritability, mood swings, decreased libido – which in some cases mimicked hormonal or psycho-emotional disorders.

Analysis of symptoms by age categories revealed the following trends: in patients aged 18–25 years, neurological complaints prevailed (paresthesias, headache, sleep disturbances), in the age groups 26–35 and 36–45 years, joint and emotional-vegetative manifestations predominated, in older age groups (46–65 years), multisymptomatic involvement of the nervous and musculoskeletal systems was observed.

The analyzed clinical data allow us to conclude that Lyme disease has a pronounced sex and age specificity in its course. In women, the disease is more often masked as gynecological or neurovegetative conditions. This may lead to a delay in correct diagnosis by 6–12 months or more, increasing the risk of chronic progression.

The results of the study also indicate the needing to include Lyme disease in the list of differential diagnostic measure in the presence of gynecological complaints of unclear origin, especially with negative results of hormonal studies or the absence of morphological pathology. This approach is particularly important given that gynecological symptoms may precede the development of more specific Borreliosis symptom manifestations, which delays correct diagnosis and initiation of therapy. Early consideration of Lyme disease in such cases can prevent unnecessary endocrine or gynecological interventions and allows timely initiation of appropriate antibiotic treatment. Thus, heightened clinical vigilance is required in women with atypical or multisystem complaints, particularly in endemic regions.

Discussion

The present study demonstrates that Lyme disease presents with a wide spectrum of non-specific clinical manifestations, highlighting the diagnostic challenges, especially in patients with musculoskeletal, neurological, or gynecological symptoms. Musculoskeletal pattern, including arthralgia and arthritis, were the most frequent manifestations, affecting large joints such as the knees in prevalence. These findings are consistent with the established understanding of late-stage Lyme borreliosis as a multisystem disease with joint involvement in majority. Neurological symptoms, particularly migraine-like headaches, were common among younger women, while climacteric-like symptoms were notable in perimenopausal women. This underscores the potential for Lyme disease to mimic endocrine, gynecological, or neurovegetative disorders, often leading to holdback in correct diagnosis and treatment. Such retardation may contribute to chronic disease progression and persistent symptoms even after appropriate therapy.

Sex-specific patterns were observed in our cohort. Gout was observed exclusively in men over 50, while climacteric-like symptoms were restricted to perimenopausal women. These patterns emphasize the need for sex- and age-tailored diagnostic attention. Interestingly, the overall prevalence of major symptoms did not differ probable and significantly between men and women, and the distribution of symptoms was similar among sera-positive and -negative patients. This finding indicates that is no individual, pathognomonic symptom for Lyme disease and reinforces the necessity of combining epidemiological data, clinical presentation, and laboratory testing for corrected diagnosis.

Laboratory confirmation of Lyme disease was achieved in 27.8% of patients. Repeat testing in certain cases proved essential for confirming this diagnosis. Multisymptomatic presentations, particularly in women, suggest that clinical evaluation should incorporate a broad spectrum of potential presentation, including gynecological and neuropsychiatric symptoms.

Our findings highlight the importance of a multidisciplinary approach in managing Lyme disease, particularly in women, involving both infectious disease specialists and gynecologists. Early diagnosing and timely antibiotic therapy are critical in preventing chronic complications and improving reproductive and other health outcomes. Furthermore, adjunctive measures, including physiotherapy, psychological support, and adequate lifestyle modifications, may help alleviate residual symptoms and enhance quality of life.

These results confirm previous studies which demonstrating the “great imitator” nature of Lyme disease and emphasize the need for heightened clinical awareness, especially in endemic areas, to ensure early and correct diagnosis. Future prospective studies with larger cohorts and multivariate analyses are warranted to further clarify risk factors, optimize diagnostic algorithms, and evaluate long-term outcomes.

Study limitations

The retrospective nature of this study, single-center design, and reliance on archived medical records limit the generalizability of the findings. Laboratory testing may have missed early or late-stage infections due to delayed seroconversion or incomplete PCR analysis. Selection bias may exist, as more symptomatic patients are likely overrepresented. Additionally, the presence of concomitant conditions may have influenced symptom presentation, complicating attribution solely to Lyme disease. Long-term outcomes and persistent symptoms could not be fully assessed due to the limited follow-up period.

Conclusions

1. Lyme disease presents with a wide spectrum of symptoms, showing clear sex- and age-related differences: women often have gynecological/neurovegetative complaints, men primarily musculoskeletal and neurological.

2. Infection can affect female reproductive health, causing menstrual irregularities, dyspareunia, and ovulatory dysfunction, most of which improve after antibiotic therapy.

3. Diagnostic delays increase the risk of chronic disease due to nonspecific, multisystemic symptoms and low clinical suspicion.

4. Interdisciplinary assessment and repeat serological testing are essential; screening algorithms for women with unclear gynecological complaints are recommended.

Conflict of interest: The authors report no conflict of interest

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