

Correlation between chronic arthritis patients confirmed with questionnaire and serologic test of Lyme disease

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Abstract. *Lyme borreliosis* is the most common tick-borne disease, and frequency of arthritis complication later. The objective of this study was to determine the seroprevalence of Lyme disease and to evaluate its correlation with chronic arthritis. This epidemiologic cross sectional study included 41 healthy individuals who had chronic arthritis and bitten by ticks underwent questionnaires, and laboratory tests consisted of a routine blood sample, serum uric acid, and IgG ELISA for Lyme. There was 7.32% presence of positive IgG for Lyme. Samples with positive IgG for Lyme were further evaluated for rheumatology marker. We found three samples with a positive rheumatoid factor, two samples had positive anti-MCV, and 1 sample had slightly increased CRP. Three Lyme positive samples had normal EULAR scoring. It was the first Lyme disease case found in Indonesia, particularly in 4 villages of Sibolangit, Deli Serdang, North Sumatera. The assessment made by analysis the questionnaire, evaluation the blood test, and confirmed positive Lyme disease, and at last, we found the correlation between chronic arthritis with positive test Lyme.

1. Introduction

Lyme disease, or *Lyme borreliosis*, which is caused by *Borrelia burgdorferi sensulato*, group of genetically diverse spirochetes, is one of the most prevalent tick-borne zoonoses and can cause complex multisystem disorders in human. Clinical manifestation of Lyme disease is heterogeneous and in the early phase mainly include erythema migrans (EM) and in later stage joint became affected.[1,2]

Lyme disease was popular in 1976 in Lyme country of Connecticut, the United States in juvenile suffering from arthritis. The disease is endemic in United States, Europe and also has been reported from Asia [3-13], with seroprevalence ranging from 5.1-26%. Prevalence and incidence in Indonesia are unknown, and this research was undertaken to study the seroprevalence of *Borrelia burgdorferi* infection in Sibolangit, Deli Serdang, North Sumatera, also to know the correlation between arthritis chronic and serologic IgG Lyme test.



2. Materials and Methods

2.1. *Volunteers of healthy subjects*

We performed a cross sectional study of persons aged 18-40 years who exposed to ticks bite, working in the forest, and having unexplainable persistent joint pain with no response to painkiller in the last 2 years. Our research was held from December 2016 to January 2017 in four villages in Sibolangit, North Sumatera. The location has rich wooded area. The condition of the people living there was frequently exposed to atick bite. The study was carried out in three steps consisted of questionnaires, blood samples, and Lyme IgG ELISA.

2.2. *Criteria samples*

2.2.1. Inclusion criteria. The first criteria by questionnaire areabout their age, range from 18 to 40 years, had the experience bitten by ticks, and pain at the joint. Afterward, we performed a physical examination to ensure whether there are any joint swelling, bone deformity, acute joint pain, or fever. Respondents who were not diagnosed with rheumatoid arthritis (by ACR 1987 and EULAR criteria), osteoarthritis, gout, and septic arthritis.

2.2.2. Exclusion criteria. Everyone who had joint swelling and deformities bone, acute joint pain, temperature above 37,5°C, age above 40 and below 18 years old.

2.3. *Serologic methods*

Serologic tests were by ELISA for IgG anti-Borrelia (ORG911G). The cut-off for the assay is 25 U/mL, which value above 25 U/mL is considered as positive.

2.4. *Ethics*

Ethical clearance was approved by Faculty of Medicine, University of Sumatera Utara and informed consents were obtained from all subjects.

2.5. *Statistical methods*

Collected data were processed with computer software, calculated from descriptive statistical analysis with a questionnaire, physical examination, blood test, and score ACR 1986 and EULAR 2010 for correlation between chronic arthritis with Lyme disease.

3. Results

3.1. *Characteristic of subjects*

We identified 41 subjects; females took the place of 85.4%. Subjects were predominantly over 35 years old (43.9%). Most of the subjects were forestry workers (61%), the majority lived at Bingkawan village (43.9%) (Table 1).

3.2. *Questionnaire, interview, and physical examination*

Respondents were evaluated for their risk of Lyme disease. History of tick-bites was in all subjects. About 85.4%aware of the tick bites, with arms,were the most frequently affected body part (19.5%) (Table 2). All respondents felt the itching. Erythema migrans and pain were noticed (95.1%). The swelling was (92.7%), and warm was felt by subjects (29.3%) (Table 3). The subjects had a flu-like syndrome (73.2%) and headache (90.2%). As for rheumatologic symptoms, all subjects had arthritis (100%) and arthralgia (85.4%) (Table 4).

Table 1. Respondents characteristic.

Demography	n	%
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Gender		
Male	6	14.6
Female	35	85.4
Age (years)		
18-23	2	4.9
24-29	9	22.0
30-35	12	29.2
>35	18	43.9
Occupation		
Forestry workers	25	61.0
Household	11	26.8
Entrepreneur	3	7.3
Midwife	2	4.9
Villages		
Betismus Baru	0	0
Puang Aja	6	14.6
Sembahe	17	41.5
Bingkawan	18	43.9

Table 2. The history of exposure ticks.

Exposure ticks	n	%
History of ticks-bite		
Yes	41	100
No	0	0
Knowing site of bitten		
Yes	35	85.4
No	6	14.6
Part of body of tick-bite		
Hands	8	19.5
Legs	7	17.1
Abdomen	7	17.1
Armpit	5	12.3
Ears	3	7.3
Back	2	4.9
Back and legs	2	4.9
Hand and legs	2	4.9
Navel	1	2.4
Tigh	1	2.4
Neck	1	2.4
Palpebra	1	2.4
Chest	1	2.4

Table 3. Skin symptoms when tick bite.

Symptoms	n	%
Itching		
Yes	41	100
No	0	0
Swelling		
Yes	38	92.7
No	3	7.3
Pain		
Yes	39	95.1
No	2	4.9
Erythema migrans		

Yes	39	95.1
No	2	4.9
Warm		
Yes	12	29.3
No	29	70.7

Table 4. Symptoms appear after bitten by ticks in the last two years.

Symptoms	n	%
Flu-like syndrome		
<i>Feverish</i>		
Yes	30	73.2
No	11	26.8
Headache		
Yes	37	90.2
No	4	9.8
Rheumatologic complaint		
<i>Arthralgia</i>		
Yes	35	85.4
No	6	14.6
<i>Arthritis</i>		
Yes	41	100
No	0	0

All respondents had taken blood samples. Routine blood samples shown leukocytosis (22%), neutrophilia (19.5%), eosinophilia (61%), elevated ESR (41.5%), and hyperuricemia (26.8%) (Table 5).

Table 5. Routine blood test and uric acid serum.

Blood test	n	%
Leukocytes		
Normal	32	78.0
Leukocytosis	9	22.0
Neutrophils		
Normal	33	80.5
Neutrophilia	8	19.5
Eosinophils		
Normal	16	39.0
Eosinophilia	25	61.0
Erythrocyte sediment rate (ESR)		
Normal	24	58.5
Increase	17	41.5
Urid acid		
Normal	30	73.2
Increase	11	26.8

Of 41 healthy subjects that were sampled for ELISA IgG for Lyme, three were found positive, one borderline, and others were negative (Table 6). The three samples found positive for Lyme IgG, continued to be checked RF, anti-MCV, and CRP tests. Three samples were found positive for RF, one sample was positive for CRP, and two samples were positive for anti-MCV (Table 7).

Table 6. Serologic Lyme test.

ELISA Borrelia IgG test	n	%
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Negative (<20U/ml)	37	90.24
Borderline (20-25U/ml)	1	2.44
Positif (>25U/ml)	3	7.32

Table 7. Rheumatoid profile blood samples of three positive IgG Lyme.

Rheumatoid profile	n	%
C-reactive protein (CRP)		
Normal	2	66.7
Increase	1	33.3
Rheumatoid factor (RF)		
Positive	3	100
Negative	0	0
Anti-mutatted citrullinated vimectin (anti-MCV)		
Positive	2	66.7
Negative	1	33.3

4. Discussion

The result of the ELISA IgG Lyme test method used in the presented study showed 7.32% seropositive sample. Indonesia, which geographically had a large forest, had intense contact with a tick in their daily activities so increased to be bitten. Most of them had urticaria and chronic arthritis. In the first step, we used questionnaire and physical examination to determine Lyme disease and chronic arthritis.[14]

Chronic arthritis can be caused by rheumatoid arthritis, osteoarthritis, gout and septic arthritis, so we need to rule out the above causes.[15-19] To confirm the chronic arthritis was caused by a tick bite, we did serologic IgG test. Our research found three samples positive test Lyme. Sibolangit villages are the first area encountered cases of Lyme arthritis and also first case report Lyme disease in Indonesia. To get more accurate seroprevalence of Lyme disease, this study recognizes that more samples are needed.

This study should have a radiological examination to exclude RA and OA, only meet the incomplete ACR 1987 criteria.

Three samples of seropositive IgG Lyme research further followed by CRP, RF, and anti-MCV [20] are specific for RA. Assessment in EULAR 2010, three samples were not diagnosed RA (table 7). Rheumatoid factor positive can be in normal individuals, autoimmune disease like as sjögren syndrome, and an infection such as endocarditis bacterial, and Epstein Barr virus.[21]

Rheumatoid arthritis could co-incidence Lyme disease, which Lyme IgG test positive due to anti-MCV positive needs to be done by radiography and MRI.[22]

5. Conclusion

We found a 7.32% seroprevalence of Lyme disease in Sibolangit, North Sumatera. It is the first Lyme disease cases found in our country. Further research was needed to find closer correlation between chronic arthritis with Lyme disease

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