



Evaluation of the Surface Water Polluted with Pathogenic Leptospirosis in Mazandaran Province (North of Iran) at 2014

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Abstract

Introduction: the aim of this study was Recognizing the surface water pollution with *Leptospira* in different geographic areas of Mazandaran province (north of Iran). This evaluation helped us to recognize the areas with higher risk of human infection and design a preventive program.

Procedure: 100 ml water was taken from paddy fields, streams, puddles, and rivers as samples. The samples were poured into sterile polypropylene tubes and immediately sent to the Molecular Cellular Research Center in Sari and were tested.

Results: The results showed that 20 samples, out of 240 analyzed samples, were positive in terms of pathogenic species and 220 samples were negative. Also, 140 samples were positive in terms of non-pathogenic species and 100 samples were negative.

Discussion: the results reveal the presence and distribution of non-pathogenic species of *Leptospira* was more than the pathogenic species in Mazandaran province.

Key words: *Leptospirosis, Mazandaran, Pathogenic, Non-Pathogenic*

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1. Introduction

Leptospirosis is an important disease that affects humans and animals, with a worldwide distribution that affects 160 species of mammals. The main sources of this disease are rodents and rats although other wild mammals, pets and domestic animals may carry these micro-organisms. The bacteria can enter the body through skin or mucous membranes (eyes, nose, or mouth), especially if the skin is broken from a cut or scratch. Drinking contaminated water can also cause infection. Outbreaks of Leptospirosis are usually caused by exposure to contaminated water, such as floodwaters. Organisms can cause Leptospirom (blood infection) and it subsequently spreads to all parts of body. The proliferation of bacteria takes place in blood and tissues. Although *Leptospira* mainly infect the kidney and liver, each part of the body may be affected (1, 2).

This disease may be caused by pathogenic *Leptospira* and be characterized by a wide range of clinical symptoms from nonobvious infection to fulminant and lethal disease. Leptospirosis, in its mild form, may be mistaken for influenza and cause symptoms such as headache and myalgia. Severe Leptospirosis is associated with jaundice and renal dysfunction and bleeding disorder and is known as Weil syndrome (1-4).

This disease is most prevalent among men and more common in temperate or tropical climates. The peak incidence of the disease is in the summer and autumn in the West and rainy seasons. It is an occupational hazard for many people who work outdoors or with animals, including farmers, mine workers, sewer workers, slaughterhouse and animal caretakers, fish workers, and dairy farmers (1,5). The definitive diagnosis of leptospirosis depends on removing the

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organism from the patient or seroconversion with increased antibody titers in microscopic agglutination test (MAT) (1-4). Leptospirosis is regarded as a worldwide recurrent disease since recently major epidemiology has occurred in Asia, Center and South America, and the United States (1,6).

Mazandaran province (North of Iran) with its predisposing climatic conditions is an area with higher prevalence of this disease. Babamahmoodi et al pointed, in their limited study in 2004 for two months in Ghaemshahr, to the prevalence of this disease with the rate of 29.4 while this rate in Gilan province was 20.5 (7, 8).

In this regard, this study aims at investigating the surface water polluted with pathogenic Leptospirosis in Mazandaran province at 2014.

2. Methods and Materials

The areas in this cross-sectional study were the rural areas in Mazandaran. Considering the study by Issazadeh et al in Gilan province (9) who reported the pollution in rice farms as 35%, water channels as 35%, and rivers as 40%, the sample size of the present study is 240 cases, regarding 90% strength and 0.05% error percentage, and the related statistical formula.

Since there are 16 towns in the province, the sample size was divided based on the extent of the rural areas and through classified statistical sampling method and then, the health centers were selected by sortition. 100 ml water was taken from paddy fields, streams, puddles, and rivers as samples. The samples were poured into sterile polypropylene tubes and immediately sent to the Molecular Cellular Research Center in Sari and were tested by the extraction of DNA and PCR methods.

2.1 Statistical Analysis

The data were analyzed by SPSS18, and the concentrations of pathogenic species of *Leptospira* were measured and compared. The considerable differences in the tests were considered significant by Chi-Square tests and ANOVA ($p < 0.05$).

3. Results

20 samples (out of 240 samples) were pathogenically positive and 220 samples were negative. Moreover, 140 samples were positive in terms of non-pathogenic species and 100 samples were negative.

The following Table (table 1) shows the distribution of pathogenic species in terms of town. Neka and Ghaemshahr had the highest rates of positive cases.

Table 1. distribution of pathogenic species in terms of town

City	Pathogenic species		All
	Positive	Negative	
Chaloos	0	4	4
Ghaemshahr	4	60	64
Amol	0	12	12
Babol	0	14	14
Baladeh	0	4	4
Behshahr	3	6	9
Chaloos	2	3	5
Chamestan	0	4	4
Davij	0	3	3
Farahabad	0	2	2
Galoogah	2	2	4
Joybar	0	12	12
Kiakola	0	6	6
Kiasar	0	4	4
Neka	4	6	10
Noor	0	5	5
Noshahr	0	6	6
Royan	0	4	4
Sari	4	27	31
Shahsavari	0	6	6
Shirgah	0	7	7
Zirab	1	3	4
Total	20	200	220

The following Table (table 2) shows the distribution of non-pathogenic species in term of town. Sari, Babol, and Ghaemshahr had the most rates of positive non-pathogenic cases.

Table 2. distribution of non-pathogenic species in term of town

City	Non-pathogenic species		All
	Positive	Negative	
Chaloos	2	5	7
Ghaemshahr	31	40	71
Amol	9	3	12
Babol	11	6	17
baladeh	4	2	6
behshahr	8	4	12
chaloos	4	3	7
chamestan	4	2	6
Davij	2	2	4
farahabad	2	0	2
galogah	1	2	3
joybar	10	5	15
kiakola	4	3	7
kiasar	1	0	1
Neka	9	2	11
Nor	3	1	4
Noshahr	4	1	5
Royan	3	1	4
Sari	16	12	28
shahsavar	4	1	5
Shirgah	5	1	6
Zirab	3	1	4
Total	140	100	240

4. Discussion

Leptospirosis is one the most prevalent diseases in countries with temperate climate. Human is usually the last host and the main sources of this disease are animals (particularly rats) in terms of the severity of infection (severity of infection in kidney and urinary excretion of the organism (1). Leptospirosis is a bacterial disease caused by *Leptospira* species of the spirochete family, which affects humans and animals. The main sources of this disease are rodents but some domestic animals (sheep, cow, horse, and cat) can play an important role in human infection with this bacteria. Animal infection usually occurs in infancy (10, 11). A large number of these animals have chronic infection with no symptom and may continuously or intermittently excrete the organism from urine to end of its life (2, 12). This organism can survive for weeks or months in water or moist soil. The bacteria can enter the body through skin or mucous membranes (eyes, nose, or mouth), especially if the skin is broken from a cut or scratch. Drinking contaminated water can also cause infection. Outbreaks of leptospirosis are usually caused by exposure to contaminated water, such as floodwaters. In developing countries like Iran, it is regarded as an occupational hazard and can be observed more in warm seasons among farmers, animal caretakers, slaughterhouse workers, and fish workers. This disease is commonly occurring in areas with temperate climate, particularly in cities the North of Iran, such as Gilan and Mazandaran provinces (8, 9), and causes considerable morbidity and mortality in these areas, especially in active people.

The results of this study showed that 20 samples (out of 240 analyzed samples) were pathogenically positive and 220 samples were negative. Moreover, 140 samples were positive in terms of non-pathogenic species and 100 samples were negative. These results indicate the presence and distribution of the non-pathogenic species is more in the province rather than the pathogenic species. The highest rate were non-pathogenic species in Sari, Babol, and Ghaemshahr, and Neka and Ghaemshahr had the highest rates of positive pathogenic species.

Rostampour et al conducted a project in Tonekabon on 115 samples, including 67 samples from water and 36 cases from soil, and 12 samples from rodent droppings. Their results showed that 38 samples (33%) had pathogenic *Leptospirosis* (13).

One of the issues that is very important in studying the *Leptospirosis* species is the frequency of pathogenic species that are hazardous for humans and cause infection. The present study showed that the prevalence of the pathogenic

species studied in the areas selected for this study was far less than the cases studied by Rostampour et al in Tonekabon, who reported the prevalence of the pathogenic species as 33% (13). However, the prevalence of the pathogenic type of *Leptospira interrogans* was reported as 4% by Issazadeh et al who conducted a project in Gilan province, conforming to the results of the present study to a large extent (9).

Conclusion

Finally, the results of the present study showed that the pathogenic type present in Mazandaran is *Leptospira interrogans* and is more prevalent in Neka, Ghaemshahr, and Sari.

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