

Study of the Frequency of Leptospirosis in Individuals Referred to Leptospirosis Diagnosing Center in Mazandaran Province, North of Iran, During 2005-2009

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Abstract: Leptospirosis is one of the most important zoonotic diseases, which is particularly prevalent in tropical and subtropical regions with a low socioeconomic status. Most of the cases of human leptospirosis worldwide have been attributed to rodents. Human leptospiral infection primarily results from direct or indirect exposure to the urine of infected animals. The present study is a descriptive retrospective study of all cases of leptospirosis that were diagnosed and confirmed to have the disease between January 2005 and December 2009 in Mazandaran Province, a northern province in Iran. Blood samples were collected from all suspected cases to measure anti-*leptospira* antibody by Immuno-Fluorescence Antibody (IFA) technique with a kit manufactured by Pasteur Institute of Iran. From 761 suspected sera sent to leptospirosis diagnosis center, 136 (17.9%) were confirmed to be affected to leptospirosis. Men were more affected (76.4%) than women (23.6%) ($P < 0.05$) because in the north of Iran most of patients are males who live in rural area and work in rice farms. With regard to location of residence, most of the affected people (68.4%) lived in rural areas while residents of urban areas were less affected (31.6%). This study also shows that most affected people are farmers and individuals older than 50 years of age.

Key words: Leptospirosis • Zoonotic • IFA • Incidence rates • Iran

INTRODUCTION

Leptospirosis is one of the most zoonotic diseases that are particularly prevalent in tropical and subtropical regions with a low socioeconomic status. It is evident that the epidemiology of leptospirosis involves domestic animals and wildlife. Rodents are important maintenance hosts and the main source of leptospiral infection to livestock and humans. Most of the cases of human leptospirosis worldwide have been attributed to rodents [1]. Human leptospiral infection primarily results from

direct or indirect exposure to the urine of infected animals. Rodents, wild and domestic animals are reservoirs of *leptospires*. After infection with distinct pathogenic serovars, most animals become carriers for long periods of time, even for a life time. Most pathogenic *leptospires*, e.g. Serovars of *leptospira interrogans sensu lato* can remain in kidneys of their hosts and are excreted periodically with the urine in the environment [2]. Some pathogenic *leptospires* may survive in water and moist soil for a long time and can penetrate to circulatory system of another host (animal or human) through injured

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skin and mucosal membranes. In contrast to the natural hosts, such accidental hosts mostly become ill. There are no known serovars which are adapted to humans [3].

Few studies of leptospirosis have been made in Mazandaran Province, north of Iran. Lack of information on the disease incidence entails investigating the epidemiological trend of human leptospirosis in this region.

MATERIALS AND METHODS

The present study is a descriptive retrospective study of all cases of leptospirosis occurred in Mazandaran Province, north of Iran that were diagnosed and confirmed to have the disease between January 2005 and December 2009. Hospitalized cases with clinical symptoms including fever, severe headache, myalgias, conjunctiva suffusion, jaundice, general malaise and joint pain as well as having positive history of working in farm or contact with animals were considered as suspected patients of leptospirosis, by a physician in all hospitals of the province. The mentioned symptoms are according to the World Health Organization criteria [4]. One blood sample was collected from all suspected cases to assess the titer of anti-*leptospira* antibodies by Immuno-Fluorescence Antibody (IFA) technique using a kit manufactured by Department of Parasitology, Pasteur Institute of Iran and as antigen the *Leptospira biflexa* serovar *patoc* 1 strain grown in Korthof's medium.

All blood samples were sent to Laboratory of leptospirosis, Department of Parasitology, Amol Research Center, Pasteur Institute of Iran in Amol, Mazandaran Province, Iran. Confirmed cases were those that presented clinically compatible illness and one of the following criteria: anti-*leptospira* antibody titer $\geq 1:100$, or a four-fold or higher increase in anti-*leptospira* antibody titer between the first and the second serum samples (taken in a 15 days interval at least), or presenting titer conversion from negative to positive in the second serum sample [4].

For each confirmed case, epidemiological data were obtained using a form filled out by the physician requesting the laboratory test. The questionnaire included personal data (age, gender, profession and place of residence), source of drinking water, date of symptoms development and date of admittance to the hospital. All completed forms were brought from Mazandaran and Babol Health Centers, the two major health centers in Mazandaran Province, to our laboratory and the collected data were analyzed with Z-test and SPSS statistical software.

RESULTS

During January 2005 to December 2009, 761 leptospirosis suspected sera were sent to leptospirosis diagnosing center from all over Mazandaran Province. From those, 136 (17.87%) samples were confirmed to be affected with leptospirosis. The highest rate of incidence

Table 1: Incidence rates of leptospirosis in Mazandaran Province, north of Iran from January 2005 to December 2009 according to number of cases, gender and place of residence of patients.

| Years of study | Number of samples | Morbidity rate No. (%) | Gender of patients | | Place of residence of patients | |
|----------------|-------------------|------------------------|--------------------|----------------|--------------------------------|---------------|
| | | | Male No. (%) | Female No. (%) | Urban No. (%) | Rural No. (%) |
| 2005 | 24 | zero | zero | zero | zero | zero |
| 2006 | 45 | 2 (4.4) | 2 (100) | zero | 1 (50) | 1 (50) |
| 2007 | 192 | 60 (31.2) | 51 (85) | 9 (15) | 17 (28.3) | 43 (71.7) |
| 2008 | 160 | 29 (18.1) | 23 (79.3) | 6 (20.7) | 7 (24.1) | 22 (75.9) |
| 2009 | 340 | 45 (13.2) | 28 (62.2) | 17 (37.8) | 18 (40) | 27 (60) |
| Total | 761 | 136 (17.9) | 104 (76.4) | 32 (23.6) | 43 (31.6) | 93 (68.4) |

Table 2: Incidence rates of leptospirosis in Mazandaran Province, north of Iran from January 2005 to December 2009 according to patient's age and occupational status.

| Years of study | Number of patients based on occupational status | | | | | Number of patients based on age groups | | | | | |
|----------------|---|----------|---------------|-----------|--------|--|-------|-------|-------|-------|------|
| | Farmer | Employee | Self employed | Homemaker | Others | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | > 50 |
| 2005 | zero | zero | zero | zero | zero | zero | Zero | zero | zero | zero | zero |
| 2006 | 2 | zero | zero | zero | zero | zero | Zero | zero | zero | zero | 2 |
| 2007 | 46 | 2 | 6 | 4 | 2 | zero | Zero | 7 | 9 | 16 | 28 |
| 2008 | 28 | zero | zero | zero | 1 | zero | Zero | 2 | 6 | 11 | 10 |
| 2009 | 22 | 4 | 3 | 3 | 13 | zero | 4 | 11 | 6 | 14 | 10 |
| Total | 98 | 6 | 9 | 7 | 16 | zero | 4 | 20 | 21 | 41 | 50 |

occurred in the year 2007. Considering the complete period of study, the incidence of the disease was higher in man (76.4%) than in women (23.6%) ($P < 0.05$) and was prevalent in rural areas (68.4% of the cases) compared to the urban areas (31.6% of the cases) ($P < 0.01$) (Table 1).

Patients were also analyzed in regard to their occupational status and age. According to occupational status the highest incidence rate was observed in farmers and according to age most patients were above 50 years of age (Table 2).

DISCUSSION

This study reflected all of the reported leptospirosis cases occurred in Mazandaran Province, north of Iran, from January 2005 to December 2009. Leptospirosis is a globally important zoonotic disease most commonly found in tropical or sub-tropical countries and may be prevalent in both urban and rural regions. Annual incidence is estimated from 0.1-1 per 100,000 in temperate climates to 10-100 per 100,000 in the humid tropical areas [5, 6]. As happens in many regions worldwide, the actual incidence of leptospirosis in the Asia Pacific region is not well-documented. Aside from underreporting, incidence data are further compromised by the unavailability of laboratory diagnosis.

Within the Asia Pacific region, Southeast Asia and Oceania appear to have the highest incidence of leptospirosis [7]. Major outbreaks of the disease in South-East Asia due to flooding were reported in Orrisa, Jakarta and Mumbai. It has been a continuing and significant problem in the densely populated, flood-prone low lying areas of India [8]. In Bangladesh and Nepal, besides the environmental and sanitary conditions which are similar to those in India, the problem of overcrowding also contributes to the burden of disease. A serological survey in a rural flood prone district of Bangladesh in 1994 showed 38% seropositivity in 89 samples of human sera tested, indicating that the rural population is at high risk of leptospiral infection [9, 10]. In Thailand, data from disease notification reports indicated an increase in the incidence rate from less than 0.3 per 100,000 in 1995 to 23.7 in 2000, with a drop in subsequent years. The vast majority of the cases (90%) were reported in the Northeast region, primarily as a result of flooding and the emergence of a highly virulent clone. A recent seroprevalence study at a hospital on the Thai-Myanmar border revealed that 17% of patients who sought treatment for fever were diagnosed with leptospirosis [11, 12]. For the year 2008,

the total number of notifications for Australia was 112 cases. This is the lowest number of reported cases in over ten years and represents a downward trend since a peak in 1999 [13].

In the North of Iran, many studies pointed out that number of male patients is higher than female's because in this area most of the patients are males who live in rural area and work in rice farms. Besides, due to their different tasks in farming, men are more vulnerable to skin scratches and infection than women [14, 15]. Mazandaran Province has mild wet climate that facilitates getting infected with leptospirosis in the region. Our study suggested that medical practitioners should pay more attention to leptospirosis in farmers during summer season.

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