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## Incidence of Leptospirosis in Mazandaran Province, North of Iran: A One Year Survey

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**Abstracts:** The aim of this study was to provide the first report of incidence of leptospirosis and to determine the epidemiology of this zoonotic disease in Mazandaran Province, North of Iran. In the period of one year, from April 2007 to April 2008, forty seven confirmed reports of human cases of leptospirosis was received by Mazandaran Health Centre from local hospitals and leptospirosis laboratory. The annual incidence rate for the total population was 1.6 per 100,000 person-year. The majority of cases were males (84.1%). The maximum number of cases was seen to occur between 40 and 59 years of age. Seasonal outbreak of leptospirosis was seen in summer (70.3%). Farmers (57.4%) more frequently affected by disease than other occupations. In conclusion, it is necessary for medical practitioner to pay attention to leptospirosis in farmers during summer season.

**Key words:** Leptospirosis, incidence, zoonosis

### INTRODUCTION

Leptospirosis is presumed to be the most widespread zoonosis in the world; it is caused by pathogenic spirochaetes of the genus leptospira (Karande *et al.*, 2003). The spirochaetes are transmitted to humans from a variety of chronically infected peri-domestic mammalian reservoir hosts such as rodents, cattle, pig and dogs as well as potentially from wild mammals such as marsupials and bats (Kevin *et al.*, 2003; Perrocheau and Perolat, 1997). One notable characteristic of this zoonosis is its highly variable prevalence in a limited geographical area due to differences in land topography, soil pH, moisture and vegetative cover (Kuriakose *et al.*, 1997). Leptospirosis occurs in tropical, subtropical and temperate zones (Vijayachari *et al.*, 2008; Narita *et al.*, 2005). Human infection typically results from exposure to infected animal urine, by direct contact or indirect exposure through water or soil (Trevejo *et al.*, 1998). Risk factors for leptospirosis include living in rural and tropical settings with exposure to leptospire-contaminated fresh water and agriculture, sewer and sanitation work; military personnel are also regarded at risk because of field activities that bring them into close contact with zoonotic

reservoirs (Kevin *et al.*, 2003; Coursin *et al.*, 2000). The incidence of disease appears to be increasing in developing countries; the South East Asia region is endemic to leptospirosis. The first case of leptospirosis reported in 1960 in Iran and the first outbreak of the disease recorded in 1990s in Rasht, North of Iran. Leptospirosis is prevalent in coastal region of Northern part of Iran especially in Gilan and Mazandaran (Rahimi *et al.*, 2007). Increasingly awareness of the disease among the public and clearer understanding of clinical spectrum and typical changes in simple routine laboratory tests by medical practitioners have led to early diagnosis of leptospirosis (Kuriakose *et al.*, 1997).

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

### MATERIALS AND METHODS

The present study is a descriptive retrospective study of all cases of leptospirosis that diagnosed and confirmed to have the disease between April 2007 and April 2008. Hospitalized cases with clinical symptoms

including fever, severe headache, myalgias, conjunctival suffusion, jaundice, general malaise and joint pain as well as having positive history of working in farm or contact with animals were regarded as suspected patients of leptospirosis by a physician in all hospitals of Mazandaran Province. The mentioned symptoms are consistent with the World Health Organization (2003) criteria. Blood sample was obtained from all suspected cases to measure anti-leptospira antibody by Immuno-Fluorescence Antibody (IFA) method with a kit manufactured with Institute Pasteur, Branch of Iran. All blood samples were sent to Pasteur Leptospira Laboratory in Amol. Confirmed cases had clinically compatible illness and one of the following criteria: a single anti-leptospira antibody titer greater than 1:100, a four-fold or higher increase in anti-leptospira antibody titer between the first and the second serums specimen (with at least 15 days interval), or conversion from negative titer to positive in the second versus the first serum specimen. For each confirmed cases epidemiological data were obtained using a form filled out by the physician requesting the laboratory test. The questionnaire included personal data (age, sex, profession and place of residence), source of drinking water, date of symptoms development and date of admission to the hospital. All completed forms were sent to, Mazandaran and Babol Health Centers, the two major health centers in Mazandaran. Only confirmed cases were included in final analysis.

A total of 47 confirmed leptospirosis reports were registered by Mazandaran and Babol health centers. Epidemiological factors including locality, age, sex, occupation and seasonal variation were studied. Incidence of leptospirosis according to age, sex and place of residence presented.

### RESULTS

Forty seven cases of leptospirosis were confirmed between April 2007 and April 2008. The annual incidence rate for total population of Mazandaran Province was 1.6 per 100,000 with corresponding mortality rate of 2.1% (one person). Of the total 47 cases, men accounted for 40 cases (85.1%). The mean age of the patients was 49.3±13.3 years. The maximum number of cases was seen to occur between 40 and 59 years of age. The incidence rate increases with age, from 0.98 per 100,000 for subjects between 20 and 39 years of age to 5.13 for patients over age 60 (Table 1). The incidence rate in rural area 2.55 per 100,000 was higher than urban areas: 0.77 per 100,000. Seasonal incidence of leptospirosis was with a peak in summer months (70.3%). Patients were admitted in hospitals 8.3±5 days after the beginning of symptoms.

Table 1: Incidence Rates of leptospirosis in Mazandaran Province from 2007 to 2008 according to age, sex groups and place of residence

Parameters	No.	(%)	Population*	Incidence rates (per 100,000)
<b>Age groups</b>				
20-39	11	23.4	1113423	0.98
40-59	25	53.2	596986	4.18
60 and over	11	23.4	244969	5.13
<b>Sex</b>				
Male	40	85.1	1466870	2.72
Female	7	14.9	1455562	0.47
<b>Place of residence</b>				
Urban	12	25.5	1554143	0.77
Rural	35	74.5	1368233	2.55

\*According to the Territorial census in 2006

Out of 47 patients, 27 subjects (57.4%) were farmers, 7 patients (14.9%) housewife and 13 persons (37.7%) had other occupations (clerk, worker etc.). Exposure to contaminated water was reported in 29.8% of the subjects (2.1% to rivulets and 27.7% to water of wells).

### DISCUSSION

This study reflects all of the reported leptospirosis cases within Mazandaran Province from 2007 to 2008 and it is the first report of leptospirosis incidence from this area. Incidence of leptospirosis was 1.6/100,000 person in Mazandaran. The annual incidence of leptospirosis has protean nature in different geographical territories. The study of Ciceroni *et al.* (2000), indicates that the incidence of leptospirosis was 74.0 (0.13/100,000) cases in average annually in the three year period 1994-1996 in Italy. On the contrary, According to Vijayachari *et al.* (2008), the annual incidence of leptospirosis recorded 3.3/100,000 persons between 1997 and 1998 in Thailand. The infection is more frequently diagnosed in men. Leptospirosis is primarily an infection of adult males, which is a universal trend and has been ascribed to occupational and environment factors (Vijayachari *et al.*, 2008). Many Studies pointed out that number of male patients is more than females (Karande *et al.*, 2003; Perrocheau and Perolat, 1997; Kuriakose *et al.*, 1997; Ciceroni *et al.*, 2000; Bishara *et al.*, 2002; Mansour-Ghanaei *et al.*, 2005; Kobayashi, 2001; Babamahmoudi *et al.*, 2006; Golsha *et al.*, 2007; Honarmand *et al.*, 2005; Aliyan *et al.*, 2006). In the North of Iran most of patients are males who live in rural area and work in rice farms and due to different tasks in farming, men are more vulnerable to skin scratches and infection than women (Honarmand *et al.*, 2005). The incidence increases with age. In groups over 20 years of age the level of transmission is high which could be related with more intensive practice of hunting and fishing over age 50 (Perrocheau and Perolat, 1997). More than half of the subjects' number (57.4%) was farmers. In most researches this profession reported an occupation commonly associated with leptospirosis

(Perrocheau and Perolat, 1997; Babamahmoudi *et al.*, 2006; Honarmand *et al.*, 2005; Aliyan *et al.*, 2006). Leptospirosis is a known health hazard of rice farmers (Vijayachari *et al.*, 2008; Ciceroni *et al.*, 2000; Kobayashi, 2001). Farmers and agricultural laborers are involved in rice planting and harvesting which contributes to the exposure to contaminated water and soil (Kuriakose *et al.*, 1997). The average length of time between symptoms to admission was  $8.3 \pm 5$  days. This period is comparable with period (6-7 and 5 days) mentioned in other studies (Bishara *et al.*, 2002; Aliyan *et al.*, 2006). The incidence rate in rural area was higher than in urban region. Several investigations confirmed that leptospirosis is a rural disease (Perrocheau and Perolat, 1997; Ciceroni *et al.*, 2000; Honarmand *et al.*, 2005; Aliyan *et al.*, 2006). Contaminated water was the source disease in 29.8% of subjects. Ingesting or being submersed in river water and contact with contaminated ground water reported in many studies to be major determinants of being affected to leptospirosis (Perrocheau and Perolat, 1997; Trevejo *et al.*, 1998; Ciceroni *et al.*, 2000; Mansour-Ghanaei *et al.*, 2005; Honarmand *et al.*, 2005). Cases had maximum peaking in summer months (July to September) that demonstrated in some researches (Mansour-Ghanaei *et al.*, 2005; Kobayashi, 2001; Honarmand *et al.*, 2005). Summer is a working season for farmers in Mazandaran that increases the chance of exposure to risk factors. The mortality rate was 2.1%. The low mortality rate in recent year may indicate earlier diagnosis and treatment, diagnosing milder cases, the local population developing immunity or decreasing virulence of organisms (Kuriakose *et al.*, 1997).

### CONCLUSION

Mazandaran Province has mild wet climate that facilitates the prevalence of leptospirosis in the region. Our Study suggested that medical practitioner need to pay attention to leptospirosis in farmers during summer season.

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### REFERENCES

Aliyan, S., F. Babamahmoudi, N. Najafi, R. Qasemian, S.S. Teymouri and L. Shahbaznezhad, 2006. Clinical and paraclinical findings of leptospirosis in Mazandaran. *J. Mazandaran Univ. Med. Sci.*, 16: 78-85.

Babamahmoudi, F., N. Motamed, M.R. Mahdavi, F. Nik-Khah and K. Ghavi-Bonyeh, 2006. Seroepidemiological study of leptospirosis in ghaemshahr mazandaran province, Iran. *J. Mazandaran Univ. Med. Sci.*, 16: 51-56.

Bishara, J., E. Amitay, A. Barnea, S. Yitzhaki and S. Pitlik, 2002. Epidemiological and clinical features of leptospirosis in Israel. *Eur. J. Clin. Microbiol. Infect. Dis.*, 21: 50-52.

Ciceroni, L., E. Stepan, A. Pinto, P. Pizzocaro and G. Dettori *et al.*, 2000. Epidemiological trend of human leptospirosis in Italy between 1994 and 1996. *Eur. J. Epidemiol.*, 16: 79-86.

Coursin, D.B., S.J. Updike and D.G. Maki, 2000. Massive rhabdomyolysis and multiple organ dysfunction syndrome caused by leptospirosis. *Intensive Care Med.*, 26: 808-812.

Golsha, R., B. Khodabakhshi and A. Rahnama, 2007. Leptospirosis in golestan province in Iran (Reports of twelve cases). *J. Golestan Univ. Med. Sci.*, 2: 76-80.

Honarmand, H.R., S. Eshraghi, Z.M.R. Khorami, G.F. Mansour, M.S. Fallah, M. Rezvani and P.G.R. Abdollah 2005. Survey spread of positive leptospirosis by ELISA in Guilan province. *J. Med. Fac.*, 54: 59-65.

Karande, S., M. Bhatt, A. Kelkar, M. Kulkarni, A. De and A. Araiya, 2003. An observational study to detect leptospirosis in Mumbai, India, 2000. *Arch. Dis. Child.*, 88: 1070-1075.

Kevin, L., A. Marco, M. Gonzales, M. Dougla and W.R.C. Lagos-figueroa, 2003. An outbreak of leptospirosis among Peruvian military recruits. *Am. J. Trop. Med. Hyg.*, 69: 53-57.

Kobayashi, Y., 2001. Clinical observation and treatment of leptospirosis. *J. Infect. Chemother.*, 7: 59-68.

Kuriakose, M., C.K. Eapen and R. Paul, 1997. Leptospirosis in kolenchery, Kerala, India: Epidemiology, prevalent local serogroups and serovars and a new serovar. *Eur. J. Epidemiol.*, 13: 691-697.

Mansour-Ghanaei, F., A. Sarshad, M.S. Fallah, A. Pourhabibi, K. Pourhabibi and M. Yousefi-Mashhoor, 2005. Leptospirosis in guilan, a northern province of Iran: Assessment of the clinical presentation of 74 cases. *Med. Sci. Monit.*, 11: 219-223.

Narita, M., S. Fujitani, D.A. Haake and D.L. Paterson, 2005. Leptospirosis after recreational exposure to water in the Yaeyama islands, Japan. *Am. J. Trop. Med. Hyg.*, 73: 652-656.

Perrocheau, A. and P. Perolat, 1997. Epidemiology of leptospirosis in new Caledonia (South Pacific): A one-year survey. *Eur. J. Epidemiol.*, 13: 161-167.

- Rahimi, F., J. Vand-Yousefi, S.M. Bidhendi and M. Bouzari, 2007. Leptospirosis in the rural areas of guilan province (2004-2005). *Behbood*, 2: 197-205.
- Trejejo, R.T., J.G. Rigau-Perez, D.A. Ashford, E.M. McClure and C. Jarquin-Gonzalez *et al.*, 1998. Epidemic leptospirosis associated with pulmonary hemorrhage-Nicaragua, 1995. *J. Infect. Dis.*, 178: 1457-1463.
- Vijayachari, P., A.P. Sugunan and A.N. Shriram, 2008. Leptospirosis: An emerging global public health problem. *J. Biosci.*, 33: 557-569.
- World Health Organization, 2003. Human leptospirosis: Guidance for Diagnosis, Surveillance and Control. World Health Organization, Geneva, pp: 47-50.