Asian Journal of Epidemiology

ISSN 1992-1462

science alert
http://www.scialert.net

ANSInet
an open access publisher
http://ansinet.com

Asian Journal of Epidemiology 4 (1): 17-22, 2011
ISSN 1992-1462 / DOI: 10.3923/aje.2011.17.22

Epidemiology of Human Leptospirosis in Morocco 2001-2010

[1]Haraji Mohammed, [2]Cohen Nozha, [3]Karib Hakim, [1]Fassouane Aziz and [1]Belahsen Rekia

[1]Laboratoire de Biotechnologie, Biochimie et Nutrition, Faculté des Sciences d'El Jadida, Maroc
[2]Laboratoire de Microbiologie et d'Hygiène des Aliments et de l'Environnement Institut Pasteur Maroc, Casablanca, Maroc
[3]Unité HIDAOA, Département de Pathologie et de Santé Publique Vétérinaire, Institut Agronomique et Vétérinaire Hassan II, Rabat; Maroc

Corresponding Author: Haraji Mohammed, Laboratoire de Biotechnologie, Biochimie et Nutrition, Faculté des Sciences d'El Jadida, Maroc

ABSTRACT

Leptospirosis is probably the world's most widespread zoonosis of global importance. It occurs in both developed and developing countries and large outbreaks have been reported from all over the world. Leptospirosis is now being recognized as a re-emerging infectious disease. Understanding the epidemiology of this infectious disease in Morocco is a critical step for designing interventions and consequently diminishing the risk of leptospirosis transmission. This study reviews on the epidemiological features of leptospirosis in Morocco between 2001 and 2010. Moreover, depending on these epidemiological data preventive measures are being suggested.

Key words: Leptospirosis, epidemiology, prevention, Morocco

INTRODUCTION

Leptospirosis is a zoonosis caused by infection with the bacterium *Leptospira interrogans*. The disease occurs worldwide but it is most common in temperate regions in the late summer and early fall and in tropical regions during rainy seasons.

Leptospirosis is noticed everywhere in the world but with higher incidence in tropical countries as Latin America, India, south eastern Asia but even in temperate areas as European Union or Japan, with a lesser extend.

Leptospirosis was thought to be primarily an occupational disease. Miners were the first occupational risk group to be recognized (Buchanan, 1927; Inada *et al.*, 1916). Definitely, occupation is a significant risk factor for humans (Waitkins *et al.*, 1986).

A pattern of disease seasonality has been described with a peak incidence occurring in summer or fall in temperate regions and during rainy seasons in warm-climate regions (Levett, 2001).

Leptospirosis transmission in humans occurs by direct or indirect contact with urine, blood or tissue from an infected animal (Skardova, 2000) containing virulent leptospires (Koutis, 2007). Rats and other rodents are the most important sources for human infection (WHO, 2003).

The number of worldwide cases is not known but is estimated to be between 0.1-1 per 100,000. Population per year in temperate climates to 10 or more per 100,000 population per year in the humid tropics. During an outbreak this figure may rise to 100 or more per 100,000 (World Health Organisation, 2003). Case fatality rates can be as high as 22% (Griffith *et al.*, 2006).

In humans, the incubation period of leptospirosis ranges from 2 to 21 days with a mean of 10 days. Leptospira infections can be asymptomatic or symptomatic depending on host susceptibility and the serovar involved (Cachay, 2005).

The classic clinical syndrome has two phases: a septicemic and an immune phase (Levett, 2005) it is in the immune phase that organ-specific damage and more severe illness is seen. See text box for more information on the two phases. The typical presenting signs of leptospirosis in humans (Aliyan, 2006) are fever, headache, chills, conjunctival suffusion and myalgia (particularly in calf and lumbar areas) (Heymann, 2004) ocular jaundice (Haraji *et al.,* 2011). Less common signs include a biphasic fever, meningitis, photosensitivity, rash and hepatic or renal failure (Abd-El-Latif, 2007).

In this review the epidemiological features of leptospirosis in Morocco are being described in detail, with special focus on modes of transmission, implicated reservoir hosts and regional distribution of the infection. Preventive measures should be adapted to the changing epidemiology of leptospirosis.

MATERIALS AND METHODS

Patients with leptospirosis were identified according to a surveillance case definition based on the presence of conjunctival suffusion, a specific finding on physical examination for leptospirosis, (Faine *et al.*, 1999) Jaundice and acute renal failure (oliguria defined as urine output <500 mL/24 h, serum creatinine >2.0 mg dL^{-1}, or blood urea nitrogen >150 mg dL^{-1}). Patients were excluded if they had radiologic or laboratory evidence for another disease during hospitalization or had a discharge diagnosis other than leptospirosis. Demographic data, clinical history and laboratory findings were obtained through interview and medical chart review for all patients meeting the surveillance case definition.

From 2001 to 2010, data on demographics (age, sex and residence), onset of symptoms and country in which infection was contracted; possible exposure risks, mortality and causes of death were evaluated by standardized questionnaires sent to local health departments for every reported case of leptospirosis.

To assess temporal trends, mean annual incidences were calculated for 10 year intervals from 2001 to 2010.

Data were extracted from reports compiled by ministrie of health (DELM). Epi-Info (version 6.04) software was used for data entry and analysis from hospital-based surveillance and the case-control study.

RESULTS AND DISCUSSION

Morocco is located Northern Africa, bordering the North Atlantic Ocean and the Mediterranean Sea, between Algeria and Mauritania, between 32°00 North Latitude and 5°00 West Latitude. With Mediterranean climate, becoming more extreme in the interior, Dry, hot, sandy summers and mild, wet winters.

From 2001 to 2010, a total of 399 cases of leptospirosis were reported (DELM). During this 10 year period, the number of human leptospirosis cases generally increased, with a minimum of 18 cases in 2001 and a maximum of 97 cases in 2010 (Fig. 1). Both cases and control subjects lived in a rat infested environment.

The curve of human leptospirosis cases shows 3 peaks in 2004, 2009 and 2010. Roughly corresponding to outbreaks, respectively in Méknes, El Jadida and Fes. 249 undoubted leptospirosis cases during the period 2001-2010 were identified in the study. Men cases also predominated over those in women (349; 87.46% vs. 50; 12.53%) in both rural and urban areas (Fig. 2).

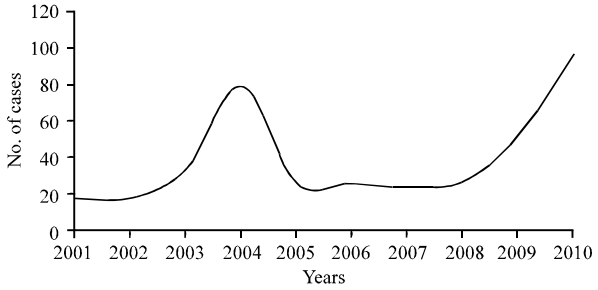

Fig. 1: Distribution of human leptospirosis cases in Morocco 2001-2010

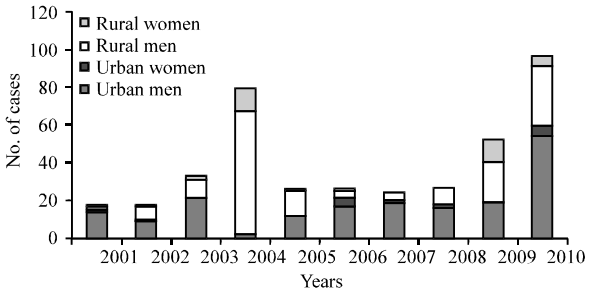

Fig. 2: Distribution of cases by sex and areas in Morocco 2001-2010

As a result of environmental and occupational factors, the epidemiological pattern of human leptospiral infection has certain characteristic features related to age, sex and season.

Although these infections may attack individuals of all ages, conditions are most favorable for infection of young adults. The most affected of the age groups was that for subjects between the ages of 20 and 40 years, though this was not statistically significant (Fig. 3).

The median age of confirmed cases was 36 years; the age of cases ranged from 4 years to 94 years (n = 399). More than half of the cases occurred among people aged <40 years (Fig. 3). The overall sex ratio of males (n = 349) to females (n = 50) was 6.98 but this varied across age groups, with a ratio of 6.8-8.8 among those aged 11-20 years and 21-30 years and a ratio of 18.75 in those aged 31-40 years (Fig. 3) providing further evidence of an occupational relationship. Though this was not a significant difference.

The mean annual incidence decreased from 0.06 per 100,000 population from 2201 to 2002 to the lowest observed incidence of 0.06 per 100,000 population ($p<0.001$) from 2001 to 2002. From the period 2003-2010 to the period 2009-2010, incidence increased to 0.31 per 100,000 populations (Fig. 4).

Cases were more common in the months of September-October for most of the years (Fig. 5). A distinct seasonal incidence was observed, with 154 (38.59 percent) of the cases occurring in September. Although sporadic cases occurred throughout the year.

Although cases have occurred all year round, the epidemiological curve of leptospirosis cases peaked during September and October of the years studied. Further studies are needed to assess the relationship between climatic conditions and associated human leptospirosis cases.

Major epidemiological risk factors noted in our patients include wet environmental living conditions, lack of protective footwear, infestation of dwelling with rats, working in farm lands, contact with animals, especially rats, history of unprotected contact with dirty stagnant water. Most of the patients by occupation were farmers (163, 40.85%), followed by labourers (72, 18.04%),

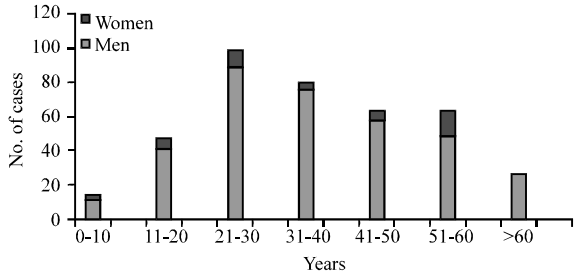

Fig. 3: Sex and age distribution of 399 cases

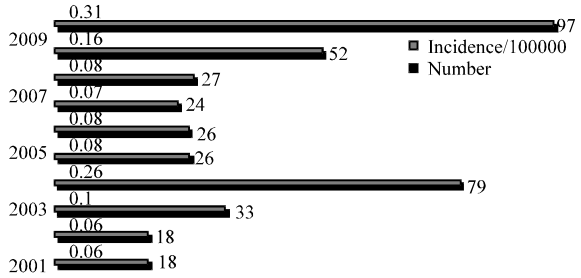

Fig. 4: Annual incidence of human leptospirosis in Morocco

chicken seller (35, 8.77%), fishmongers (18, 4.51%) butchers (12, 3%), sewermen (9, 2.25%), worker in the bath (8, 2%), others (82, 20.55%). Of all 399 cases, 38 patients died (9.52%).

Despite its limitations, this analysis may help generate hypotheses for in-depth studies that aim to identify exposure risks; it may also provide a foundation for future data collection that will lead to improvements in intervention strategies. Better standardization of the collection, validation and analysis of epidemiological and clinical data will greatly improve the ability to detect specific exposure patterns and will also enable better identification of risk groups which in turn will help researchers to adapt and target preventive measures.

No significant link between infection and sex, age or occupation could be established, suggesting a permanent exposure of the population in its daily life rather than the existence of risk groups. This study, the largest conducted to date on leptospirosis in Morocco, confirms the importance of this zoonotic disease, that must be considered a real public health issue in this country. As demonstrated by these results, leptospirosis is still an important pathological entity, both clinically and epidemiologically, in Morocco.

Prevention: The control of infections in livestock and pets reduces the risk of human disease but the existence of wildlife reservoirs complicates prevention. Rodent control can be important in preventing human infections (Massawe, 2011), particularly in urban areas. Avoidance of contact with contaminated or potentially contaminated bodies of water can decrease the risk of infection.

Domestic animals should not be allowed to urinate in water that humans contact. Draining wet areas may also decrease the incidence of disease. Food should also be protected from sources of infection. Personal hygiene and protective clothing are important preventative measures in high risk occupations. Gloves and face shields can help prevent infections when working with infected animals or tissues. We need to pay attention to leptospirosis in farmers during summer season (Esmaeili, 2009).

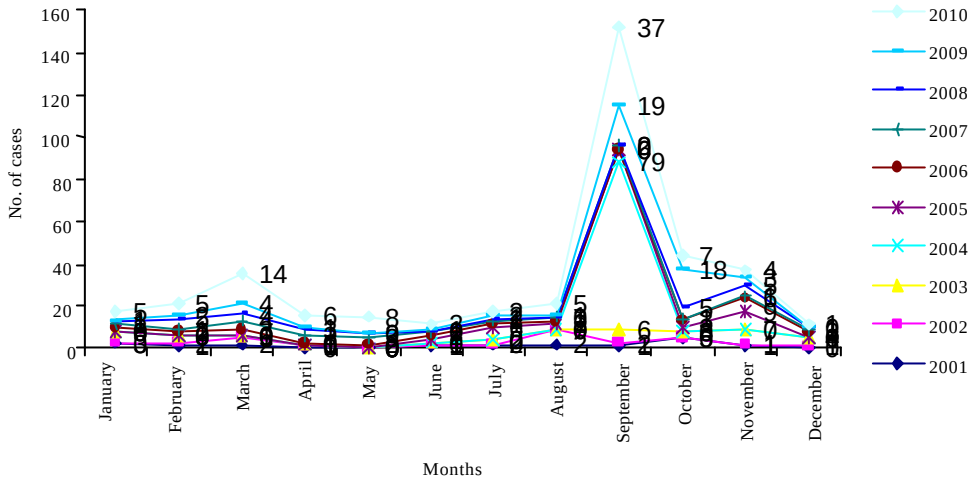

Fig. 5: Seasonal distribution of cases by months 2001-2010

In addition, persons who travel in leptospirosis-endemic areas should be informed that bathing may be hazardous in rat infected areas (Koutis, 2007). Occupational hygiene (in sewers, farmers and other high risk groups) that includes the use of water proof shoes and gloves is fundamental for preventing human leptospirosis (Koutis, 2007).

Another control measure that is critical for the disease prevention is the appropriate drainage of wet areas and this is of the most radical means of sanitation (Haraji *et al.*, 2011).

In conclusion, prevention is largely dependent on sanitation measures that are difficult to implement, especially in developing countries.

This analysis describes the current epidemiology of human leptospirosis cases but also highlights important gap in collection of essential data needed to understand this disease better and refine case management.

REFERENCES

Abd-El-Latif, M.M.S., E.M. Dauod, L.M.S. Abd-El-Latif and N.A. El-Lithy, 2007. Urinary epidermal growth factor excretion: A useful prognostic marker for progression of renal damage in children. J. Med. Sci., 7: 1171-1176.

Aliyan, S., F. Babamahmoudi, N. Najafi, A. Ghasemian, S.S. Teimouri and L. Shahbaznezhad, 2006. Clinical and para clinical findings of leptospirosis in MAZANDARAN, June-September 2004. J. Mazandaran Univ. Med. Sci., 16: 78-85.

Buchanan, G., 1927. Spirochactal jaundice. Special Reports Series, No. 113, Medical Research Council, London, UK.

Cachay, E.R. and J.M. Vinetz, 2005. A global research agenda for Leptospirosis. J. Postgrad. Med., 51: 174-178.

Esmaeili, R., A. Hesamzadeh, R. Alizadeh-Navaei, M.H. Haghshenas and F. Alhani, 2009. Incidence of leptospirosis in mazandaran province, North of Iran: A one year survey. Pak. J. Biol. Sci., 12: 1330-1333.

Faine, S.B., B. Adler, C. Bolin and P. Perolat, 1999. *Leptospira* and Leptospirosis. MediSci. Press, Melbourne.

Griffith, M.E., D.R. Hospenthal and C.K. Murray, 2006. Antimicrobial therapy of leptospirosis. Curr. Opin. Infect. Dis., 19: 533-537.

Haraji, M., N. Cohen, H. Karib, A. Fassouane, T. Dinar and R. Belahsen, 2011. A new case of Weil disease confirmed in El Jadida, Morocco. Microbiol. J., (In Press).

Heymann, D., 2004. Control of Communicable Diseases Manual. 18th Edn., American Public Health Association, Washington, DC, pp: 306-309.

Inada, R., Y. Ido, R. Hoki, R. Kaneko and H. Ito, 1916. The etiology, mode of infection and specific therapy of Weils disease (spirochactosis icteroliaemorrhagica). J. Exp. Med., 23: 377-402.

Koutis. C., 2007. Special Epidemiology. Technological Educational Institute of Athens, Athens, Greece.

Levett, P., 2005. Leptospirosis. In: Principles and Practice of Infectious Diseases, Mandell, G., J. Bennett and R. Dolin (Eds.). Chrchill Livingstone, Philadelphia, pp: 2789-2794.

Levett, P.N., 2001. Leptospirosis. Clin. Microbiol. Rev., 14: 296-326.

Massawe, A.X. and R.H. Mkundi, 2011. the type of farming practice may affect the movement and reproduction pattern of rodents in crop field: A case sudy of *Mastomys natalensis*. J. Biol. Sci., (In Press).

Skardova, I., H. prokopcakova, L. Cislakova, E. Sesztakova and J. Skarda, 2000. Monitoring leptospirosis affecting dogs in Eastern Slovakia. Pak. J. Biol. Sci., 3: 433-435.

WHO, 2003. Human Leptospirosis: Guidance for Diagnosis, Surveillance and Control. 1st Edn., World Health Organization, Malta, ISBN-13: 978-9241545891, pp: 109.

Waitkins, S.A., 1986. Leptospirosis as an occupational disease. Br. J. Ind. Med., 43: 721-725.