Original article

Human leptospirosis, in Ethiopia: a pilot study in Wonji

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Abstract

Background: Although there is no documented information so far concerning the occurrence of leptospirosis in humans in Ethiopia, climatologic, socioeconomic and cultural factors are highly favourable for the occurrence and spread of the disease in humans in the country.

Objective: The objective of this study is therefore to obtain an estimate of the occurrence of leptospirosis in humans in Ethiopia.

Method: Serum samples were collected from a total of 59 febrile patients attending the out patient department of Wonji Hospital, Shoa and Wonji Polyclinics. The samples were tested by Dri-Dot method for the presence of leptospirosis antibodies. The inclusion criteria for the patients were patients that are negative for malaria, whose chief complaint was not diarrhoeal disease and who have an axillary temperature of 37.5 ^{0}C and more.

Results: The study showed that 47.46% of the patients were positive for leptospirosis. The occurrence of the disease was more common in males than females.

Conclusions: This pilot study sufficiently demonstrated the occurrence of human leptospirosis. This is the first report on the presence of human leptospirosis in Ethiopia. Therefore, it is strongly recommended that further wider scale study should be conducted to estimate the actual prevalence of the disease and to identify the specific serovars of leptospires present in the country. [*Ethiop.J.Health Dev.* 2004;18(1):48-51]

Introduction

Leptospirosis is one of the world's most widespread bacterial diseases classified as a direct anthropozoonosis (1,2,3) affecting human and a variety of animal species caused by pathogenic leptospires. Although leptospirosis has been traditionally considered to be a rural-based disease, urban epidemics associated with severe forms of the disease are also reported to occur annually resulting in significant mortalities (4,5,6).

Pathogenic leptospires live in the kidneys of natural hosts, predominantly mammals, and are excreted with the urine into the environment where they survive for up to several months depending on favorable conditions (humid, warm and slightly alkaline).

Infection occurs by contact with infected animals, their urine or via urine contaminated environment (mostly mud and water). The infection route is through open skin and mucous membranes. Leptospirosis is a protean disease manifested in a variety of signs and symptoms, ranging from mild, flu-like, to severe, potentially fatal Weil's syndrome characterized by hepatorenal failure and haemorrhages (4). Leptospirosis mimics many other (infectious) diseases, mostly endemic in the same area causing diagnostic difficulties, both in the clinic and the laboratory, hence it may be misdiagnosed and not recognized.

In a serologic survey undertaken in Egypt in humans, 5.6% of the 513 humans showed leptospiral microscopic agglutination titres of 1:128 and above (7) and another study in the arid Mogadishu area of Somalia showed 37% positivity for leptospirosis (8).

In Ethiopia leptospirosis is a relatively unknown disease although already reported to occur in domestic animals (9). However, climatologic, socio-economic and cultural factors, playing an important role in the prevalence and spread of leptosprosis, are highly prevalent in Ethiopia. Leptospirosis in Ethiopia is currently underreported due to unawareness and the actual prevalence is expected to be high. Therefore this study was undertaken to investigate the percentage prevalence of leptospirosis cases among patients with febrile diseases attending the Wonji Hospital and Wonji and Shoa Polyclinics.

Subjects and Methods

Study site: This study was conducted at Wonji from April to July 2003. The Wonji – Shoa Sugar Factory and Sugar Estate was established in the 1950's and 1960's by the Dutch Company HVA, in the Wonji plain that lies at the down-stream of the Koka Dam in the Awash river basin. It is located in East Shoa zone of the Oromiya Region in the central rift valley of Ethiopia 110 km south east of Addis Ababa. It lies at an altitude between 1510 – 1560 metre above sea level (masl). The total population of the Wonji Shoa Estate including the surrounding villages and towns is estimated to be more than 52,000. Most of the residents of the town are employees of the Sugar Factory.

The bimodal rainfall pattern of the area does not exceed 850 mm per year and the average temperature ranges between 17 – 30 ^{0}C. The Awash River passes through the Wonji

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end of the spatula, the blue dot was suspended in the serum with a quick circular motion while pressing the flat end of

Total (%)	28 (47.46)	31 (52.54)	59

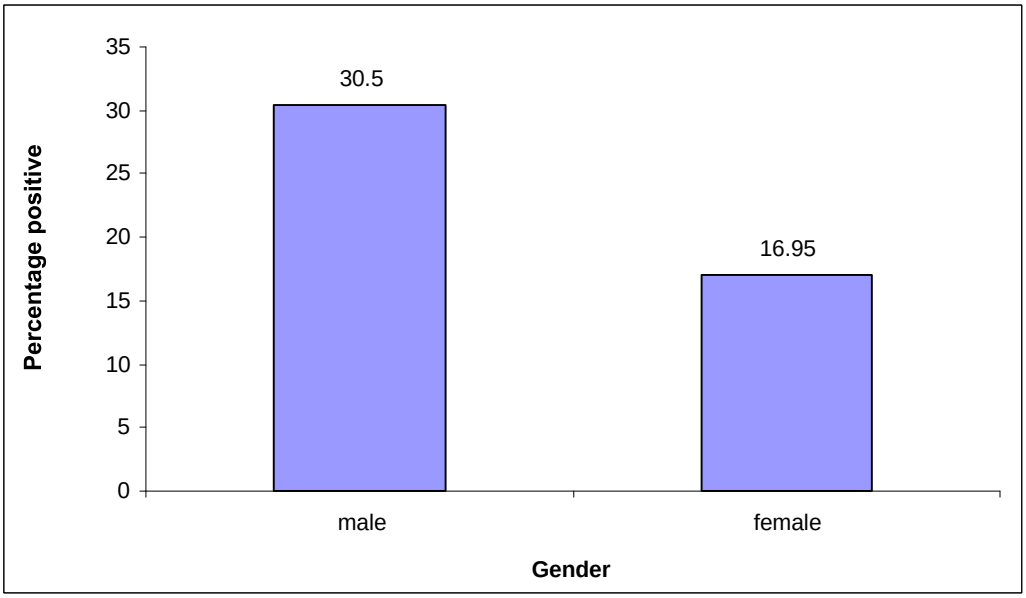

Figure 1: **Serological rapid test results for leptospirosis in human by gender at Wonji, Ethiopia**

plain that is used as a source of irrigation and also water for gardening and washing (10).

Study subjects: Blood specimens were obtained by venipuncture from 59 febrile patients attending the local Wonji Hospital and Wonji and Shoa Polyclinics. Serum separation was performed under sterile condition and screened for leptospirosis using Lepto Dri-Dot developed by Organon Teknika in collaboration with The Royal Tropical Institute (KIT) in Amsterdam. Clinical, epidemiological, and demographic data were also collected using a questionnaire.

Febrile patients who exhibit axillar temperature of 37.5 ^{0}C and more who are negative for malaria were included. Patients whose chief complaint was diarrhoea and those that are less than three years old were excluded from the study. Written consent was taken during sampling.

Serological testing: The Dri-Dot card was removed from its packaging and placed on a bench top with the blue dot facing upwards. Tenµl serum was spotted next to the blue dot and within the area marked by black circle. After breaking off a spatula and holding it with the flat surface facing downwards, with thumb and forefinger close to the the spatula on to the dot without spreading the suspension outside the marked area. Keeping the card near horizontal, the card was slowly rotated swirling the liquid in a circular motion in order to further mix latex and serum sample to induce agglutination. Results were read within 30 seconds after the start of mixing. Positive result was visually read by the aggregation of the latex particles of the test dot that revealed agglutination by Leptospira – specific antibodies present in the serum samples.

Results

Fifty nine subjects between the age of 4 and 52 were included in this study. Sample sizes for each age group were 9 for those 4-9 years old, 15 for those 10-19 years old, 20 for those 20-29, 9 for those 30-39 years old and 6 for those greater than 40 years (Table 1). The sex ratio (M:F) was 1.19:1.

Table 1: **Results of the serological rapid tests for leptospirosis in humans by age group at Wonji, Ethiopia**

Age	No. Positive	No. Negative	Total
3 – 9	4	5	9
10 – 19	6	9	15
20 – 29	8	12	20
30 – 39	6	3	9
>=40	4	2	6

All patients reported fever. Out of the 59 patients sera on which test for detection anti-leptospira antibodies was carried, 28 (47.46%) of them were positive for leptospirosis. The average age of leptospirosis sero-positive subjects (27.4 years) was significantly different from that of sero-negative subjects (19.6 years) (X^2 = 10.578 and P<0.001).

The youngest sero-positive subject was four years old and the oldest was 52 years old. Out of the 27 women tested 10 (16.95%) were sero-positive compared with 18 (30.51%) of the 32 men, and this difference was statistically significant (X^2 =4.42 and P<0.05).

Table 2: **Major sign and symptoms of leptospirosis positive patients at Wonji, Ethiopia**

Signs and symptoms	Number	% of total positive	% of total screened
Chills	28	100.0	47.4
General malaise	28	100.0	47.4
Cough	15	60.7	25.4
Headache	28	100.0	47.4
Stiff neck	9	32.1	15.2
Anuria/oliguria	8	28.5	13.5
Joint pain	28	100.0	47.4
Muscle pain	24	87.7	40.6
Nausea/vomiting	24	87.7	40.6
Photophobia	12	42.8	20.3

Discussion

Leptospirosis has not been widely studied in Africa. Therefore there are few data on seroprevalence studies in the general population and in particular in febrile patients. Seroprevalence studies in the general population in Ghana (8) humid forest areas show a prevalence rate of 33% and 18% among volunteers in Nigeria (9). On the other hand 63 serologically confirmed cases were described within 2 years in Cameroon cited by Bertherat *et al* (10). In an exhaustive serologic and epidemiologic survey carried out in northern Gabon a 15.7% leptospirosis seroprevalence rate was recorded (10).

A study undertaken in Kenya both on healthy and febrile patients showed that 19% of the cases proved to be reactive against one or more leptospiral antigens (14) and the infection was found to be prevalent among the labourers of a sugar plantation. The findings of this study concur with the occurrence of the disease at a higher prevalence rate at Wonji.

Most of the leptospirosis sero-positive subjects presented with clinical syndrome associated chills, general malaise, headache and joint pains. Whereas 85.71% had muscle pain and nausea and vomiting, 60.71% had cough and 42.86% had photophobia (Table 2). Therefore, the association of such symptoms in patients with fever of unknown origin that are negative for malaria, typhus and typhoid fever appears to be highly suggestive of such aetiology.

Leptospirosis is a disease of tropical countries and often it is endemic, although in Ethiopia its prevalence in humans is totally unknown and there is no documented evidence on its occurrence. Being a neglected disease, the results of this study have clearly demonstrated for the first time that leptospirosis is a disease that should be given greater attention.

The observed high prevalence in Wonji could be due to the tropical climate, repeated contact of the population with stagnant water and mud specially with the water that is being used for irrigating the sugarcane plantation, the lack of hygiene and poor living conditions. Exposure to contaminated water may generally explain the difference in rates of prevalence according to gender (Figure 1) and age. Infection was observed to occur at an early age, at least from four years onwards.

The study also suggests the need for instituting a wider scale study to know the actual magnitude of the problem so that appropriate diagnostic methods and treatment and prevention schedules could be devised to control its occurrence.

This study sufficiently demonstrates the existence of leptospirosis at Wonji, Ethiopia using the Dri-Dot test that was highly sensitive and specific for leptospires causing the disease. However, it would be necessary to carry out a second test to determine the specific serovars since clinical expression can differ according to the species concerned.

Among the 10 most common diseases recorded at Wonji Hospital during the last 4 years, fever of unknown origin ranked fifth, in 1999/2000, sixth in 2000/01, and 2001/02, and fifth in 2002/03 with 3675, 1350, 3408 and 4328 patients

seen at the out patient department respectively (10). Therefore, this study indicates that some of these cases could have been caused by leptospires and appropriate treatments could have been given to prevent further complications and death if the occurrence of the disease in the area had been known earlier.

Leptospirosis mimics many febrile illnesses in endemic areas and its signs and symptoms are nonspecific, making accurate diagnosis on clinical grounds a difficulty (4). Definitive diagnosis is obtained by culturing the causative pathogenic leptospires from blood and urine although it is slow. The other tests like Microscopic Agglutination Test (MAT) and Enzyme Linked Immuno Sorbent Assay (ELISA) may not be performed in endemic areas due to lack of facilities. The major advantage of the Dri-Dot assay is its capability to give fast results that are clear with a single reaction with most serum samples for case patients showing strong agglutination, visible shortly after the detection reagent is suspended in the sample (15). Therefore, the Dri-Dot test could easily be utilized for screening febrile patients so that appropriate treatment is instituted on time.

On the other hand studies conducted to determine the sensitivity and specificity of the Dri-Dot assay compared to the Microscopic Agglutination Test (MAT) which is considered to be the reference test for leptospirosis, this assay

has an overall sensitivity of 90% and an overall

specificity of 92% (11). Its specificity as well as sensitivity and its ability to remain stable for longer periods at room temperature make the test ideal for use in areas where the disease is common and where sophisticated laboratory support is not routinely available. Therefore rapid tests are useful in endemic areas and may help to improve the health care system of people living in these areas.

In conclusion the results of this study are highly suggestive of the high prevalence of leptospirosis at Wonji that would lead to a more extended study on leptospirosis in humans and animals in Ethiopia.

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