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RESEARCH ARTICLE

Seroprevalence of Leptospira antibodies among populations at risk

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ABSTRACT

Objective: This study was performed to assess the Leptospira IgG antibodies seroprevalence among populations at risk in Hodeida Governorate, Yemen.

Methods: A total of 200 subjects (136 males and 64 females) participated in this study during June and December 2012.They represented 10 sewage workers, 22 butchers, 16 construction workers, 108 agriculture workers, 20 hospital sanitary workers and 24 blood donors. Predesigned questionnaires and consent were taken from each individual. Blood samples were collected from subjects, and the sera were tested by ELISA to detect the presence of leptospira IgG antibodies. The possible related factors for seropositivity were evaluated.

Results: Leptospira IgG antibodies were found positive in 42% of the participants. The highest seroprevalence level was detected in sewage workers (80%), followed by hospital sanitary workers (60%), construction workers (37.5%) and farmers (37%). The lowest of antibodies was in butchers (36.4%). Seroprevalence among blood donors was 25% which was comparatively less than of the populations at risk. Seropositivity of Leptospira IgG antibodies was found higher among males than females (42.6% vs. 34.4%). The highest Leptospira antibodies seropositivity was among elderly participants (81.8%). The seropositivity of antibodies in population live in rural and urban areas was not significant differences. As for closely contacting with animals, the highest antibodies were discovered in people who had goats (80%) and sheep (60.9%).

Conclusion: Individuals engaged in risk activities are often exposed to leptospiral infection. Therefore, control and prevention policy toward these people are necessary. *J Microbiol Infect Dis 2015;5(1): 1-4*

Key words: Leptospira antibodies, seroprevalence, risk groups

Leptospira antikorlarının riskli gruplar arasındaki sıklığı

ÖZET

Amaç: Bu çalışma risk altındaki insanlardaki Leptospira IgG antikorlarının seroprevalansını değerlendirmek amacıyla Yemen'in Hudeyde Vilayetinde yapıldı.

Yöntemler: Bu çalışma 2012 yılı Haziran ve Aralık ayları arasında yapıldı. Çalışmaya136 erkek ve 64 kadın olmak üzere toplamda 200 kişi katıldı. Çalışmaya katılanlar 10 kanalizasyon işçisi, 22 kasap, 16 inşaat işçisi, 108 tarım işçisi, 20 sağlık çalışanı ve 24 kan bağışçısından oluşmaktaydı. Gönüllü kişiler önceden hazırlanan anketi cevaplayarak çalışmaya katıldılar. Katılımcılardan kan örnekleri alındı ve bu örneklerde Leptospira IgG antikorlarının varlığı ELISA yöntemiyle test edildi. Seropozitiflik ile ilgili muhtemel risk faktörleri değerlendirildi.

Bulgular: Leptospira antikorlarının risk altındaki toplumda sıklığı %42 olarak belirlendi. En yüksek seviye kanalizasyon işçilerinde %80 olarak tespit edildi. Kanalizasyon işçilerini sağlık çalışanları (%60), inşaat işçileri (%37,5) ve tarım çalışanları (%37) izledi. En düşük seviye kasaplarda görüldü (%36,4). Kan bağışçıları arasında seroprevalans %25 olarak bulundu ve bu da risk altındaki kişilere göre düşüktü. Leptospira IgG seropozitifliği erkeklerde kadınlara göre daha yüksekti (%42,6'ya karşılık %34,4). En yüksek Leptospira antikor serapositifliği %81,8 ile 58 yaş ve üzeri kişilerde görüldü. Kırsal alanda yaşayanlardaki leptospira IgG antikor sıklığı ile kentsel alanda yaşayanlar arasında önemli bir fark yoktu. Hayvanlarla temas halinde olanlar arasında en yüksek antikor pozitifliği keçi besleyen kişilerde (%80) ve koyun besleyen kişilerde (%60,9) idi.

Sonuç: Risk altında olan kişiler çoğunlukla leptospiroza maruz kalan kişilerdir. Bundan dolayı kontrol stratejilerinin bu kişileri hedef alması gereklidir.

Anahtar kelimeler: Leptospira antikorları, seroprevalans, riskli gruplar

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INTRODUCTION

Leptospirosisis a bacterial zoonotic disease of worldwide distribution, caused infection with pathogenic spirochete of the genus Leptospira.[1] In several countries the disease is limited to specific occupational groups, nevertheless a contaminated environment may be made any person susceptible to infection.[2]

Epidemics of leptospirosis often occur during seasonal heavy rainfall and flooding.[3] This disease has been described in several regions of the world, but it is still widely overlooked and underreported in many of developing countries.[2-4] In Yemen the seroprevalence of leptospirosis in population is absolutely unknown and there are no documented evidences on its incidence, and it is considered of ignored diseases.

Leptospirosis is caused by different serotypes of *Leptospira. interrogans* (*L. interrogans*) which is recognised to be the most prevalent zoonosis worldwide.This organism can be transmitted to humans either by direct or indirect contact with the urine of infected animals. It is usually enter the body via cuts or abrasions in the skin. Pathogenic leptospires invade the bloodstream after penetrating skin or mucous membranes. The immune response to Leptospira includes both humoral and cell mediated; after the entry of the organism into the host, both the B and T-cells are stimulated. The initial elimination was done by phagocytosis.[5-7]

The diverse clinical presentations of this disease make it essential for the laboratory to play a role in diagnosis. Microbiological diagnosis of leptospirosis aims at demonstrating the leptospiral antigens or by demonstrating an appreciable antibody response to them.[7] Misdiagnosis has become a serious matter in Yemen where dengue and malaria with overlapping clinical presentations are endemic. In this study we assessed the Leptospira IgG antibodies seroprevalence among populations at risk in Hodeida Governorate, Yemen, and studied the risk factors related to earlier leptospiral infections. Finally, in Yemen there was not any a previous report or documents about the prevalence of leptospirosis.

METHODS

This study was conducted in Hodeida Governorate, Yemen between June and December 2012. This part of our country has a high and humid temperate climate, and the populations activities are fishing, bathing, agriculture, and animals raising. Besides, the socioeconomic status and environmental factors may play important role in exposure to leptospiral infections. All participating populations were recruited from five selected areas, namely Workers City, Al-Hawak, Zabeid, Al-Lohea, and the Blood Bank.

Of 176 occupational subjects, 10 of them were sewage workers, 20 hospital sanitary workers, 16 construction workers, 108 Farmers, and 22 butchers. Also blood donors comprised 24 subjects. All of the studied populations were previously informed about the study, and consent forms were accomplished by responders. Then, a relative data were achieve data direct interview using predesigned questionnaires to obtain sociodemographic data (name, address, sex, and age, etc.), and environmental characters as ownership of companion animals (goats, sheep, dogs, cows, cats, etc.).

After enrollment, 4-5 ml of blood sample was taken by venipuncture and serum samples were separated and stored at -20 °C until use. Thereafter, sera were investigated to detect IgG antibodies to Leptospira antigens with ELISA kit (Diagnostic Automation, INC, Calabasas, USA) at National Centre of Public Health Laboratory in Hodeida City. Analysis of data was performed using Epi Info Version 6 (CDC, Atlanta, USA). The results were stated as percentage, and the variables were measured using Chi-square (χ^2), 95% confidence interval, and P-value. Thestatistically significant was considered when the probability value was equal or less than 0.05.

RESULTS

A total of 200 populations were enrolled in this study, of them 136 (68%) were males compared to 64 (32%) females, their age ranged from 18-57 years old with mean age of 47.2 ± 3.6 years. The seropositivity of Leptospira IgG antibodies was detected in 80 (40%) of 200 participants, and out of 80 populations, there were 74 (42%) occupational workers and 6 (25%) blood donors (Table 1). Seropositivity of Leptospira IgG antibodies in males was 42.6%, in females 34.4% (p=0.26). The seropositivity of Leptospira IgG antibodies in the 18-37 years old was 33.3% with statistically significant low (CI=0.5-1, χ2=3.9, P=0.04), whereas in the 38-57 years old was 36.8%, and in 58 years old and over was 81.8% This finding was statistically significant with values of χ2=18 and p=0.002. The percentage seropositivity among population live in rural areas was 40.9%, and those who live in urban areas were

39.3% without significant differences (p=0.81). The highest seropositivity of Leptospira IgG antibodies was detected in sewage workers (80%). On the other hand, the lowest levels were detected in construction workers (37.5%) (Table 2).

Our study showed the highest seropositivity of Leptospira antibodies in populations who had goats (80%). The lowest seropositivity was detected in those who had dogs 30(46.9), cows 28(46.4) and cats 70 (38.9) (Table 3).

Table 1. Seroprevalence of Leptospira antibodies in studied groups

Categories subjects	Seropositive No (%)	p value
Occupational workers (n=176)	74 (42)	0.11
Blood donors (n=24)	6 (25)	0.11
Total (n=200)	80 (42)	

Table 2. Distribution of Leptospira antibodies according to occupational subjects

Variables	Seropositive No (%)	95% CI	p value
Occupations(n=176)			
Sewage workers(n=10)	8 (80)	1.5-3.02	0.008
Hospital sanitary workers (n=20)	12 (60)	1.1-2.4	0.05
Construction workers (n=16)	6 (37.5)	0.5-1.8	0.83
Farmers (n=108)	40 (37)	0.42-1.4	0.35
Butchers (n= 22)	8 (36.4)	0.5-1.6	0.7
Blood donors (n=24)	6 (25)	0.3-1.2	0.109

CI=confidence interval

Table 3. Seropositivity of Leptospira antibodies among populations who had animals

Animal type	Population No	Seropositive No (%)	95% CI	p value
Goats	10	8 (80)	1.5-3	0.008
Sheep	92	56 (60.9)	1.86- 4.04	<0.001
Dogs	64	30 (46.9)	0.9-1.3	0.17
Cows	56	28 (46.4)	0.9-1.86	0.12
Cats	180	70 (38.9)	0.5-1.3	0.33

CI=confidence interval

DISCUSSION

Leptospirosis is a severe spirochetal zoonosis in the world. It is considered as an occupational disease of persons engaged in agriculture, sewage works, forestry and animal slaughtering.[8] To our knowledge, this study considers the first study to assess the seroprevalence of Leptospira antibodies in populations at risk in Yemen. The overall seroprevalence of leptospirosis based on Leptospira IgG antibodies detection in these groups alone was 42%. This result goes along with previously seroprevalence studies reported worldwide, in Thailand was 12.7-40.[9] and in Jakarta, Indonesia was 37%.[10] The highest findings were demonstrated in studies conducted in Ethiopia 48%,[11] in Tamil Nadu, India 58%,[12] and in Mazandaran Province, Iran 58%.[13] However, different findings were encountered among population at risk in Colombia as 19%[14] and in Tanga City, Tanzania 15%.[15] In Yemen, as for blood donors the seropositivity was found to be 6%, this finding indicates that leptospirosis is an environmental disease existing in this region.

We found that males were the predominant of contracting leptospiral infection than females, whereas Leptospira IgG antibodies detected among males were 42.6% compared with 34.4% in females, and this consistent with previously reported studies in elsewhere. In Khammouane Province, Japan the percentage in males and females was 29% and 19%[16] respectively, but in Mazandaran Province, Iran the findings showed in males 84% and in females 15%.[17] Likewise, in Ethiopia, it was reported in males was 31% and in females was 17%.[11] The variation in the findings suggests that males are likely to have leptospirosis through their daily activities or occupational exposures because there are differences in certaindaily activities between males and females.

When age was considered, the highest prevalence rate of Leptospira IgG antibodies among the studied group was found among old population (81.8%). Our results were contrasted with the findings documented from the other parts of the world, in Mazandaran province, Iran, they stated that the highest seropositivity were in aged range 40-50 years17, whereas in Chile, they indicated that the highest seroprevalence of leptospirosis based on antibodies detection in aged range 21-40 years,[18] and in India the predominant were found in the 35-44 years old 30%.[19] This difference may be explained by using different techniques for detection antibodies among studied population. Also the dif-

ferent in ages and the variability of climates and occupational exposures belongs each country may be leaded to disagreement with results.In this study we observed that, people who reside in a rural area had higher level of antibodies 36 (40.9%) matched with people who live in an urban area 44 (39.3%).

Our study showed the sewage workers and hospital sanitary workers had the highest seropositivity when compared with construction workers, farmers and butchers. This could be explained to their frequency exposure to leptospiral infection. Our study consistent with study conducted in Calicut, India, it was reported the highest seroprevalence in hospital sanitary workers was 56%, construction workers was 40%, and sewage workers was 28%.[20] It is known that infected enclosing domestic animals may be considered as source of contracting Leptospira. In this study we observed that there was an association between the seropositivity of Leptospira IgG antibodies among studies groups, and contacted animals. This fact, confirmed by study found to have the highest seropositivity for Leptospira antibodies among population engaged in animals.[21]

This study has some limitations. First, the sample people of the present study consisted of almost exclusively people at high risk exposure to leptospiral infection. It could be better comparison with them normal populatin. Secondly, population healthy adults are allowed for contributing in this study. Finally, the findings cannot be generalized to the overall Yemeni population and limited areas were selected in study.

In conclusion, our data demonstrated that people who engaged in risk activities are often exposed to leptospiral infection. Therefore, control and prevention policy toward these people are necessary. This study provides data about Leptospira antibody seroprevalence in this region. Lastly, in the future nationwide surveys among general populations are needed to assess the exact seroprevalence situation in Yemen.

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