



ORIGINAL ARTICLE

Study on Seroprevalence and Leptospiral Antibody Distribution among High-risk Planters in Malaysia

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Abstract

Objectives: To determine the leptospirosis seroprevalence and to identify the predominant infecting serovars among oil palm plantation workers.

Methods: The cross-sectional study involved 350 asymptomatic oil palm plantation workers in Melaka and Johor. A serological test using the microscopic agglutination test was conducted in the Institute of Medical Research with a cut-off titre for seropositivity of $\geq 1:100$.

Results: The overall seroprevalence of leptospiral antibodies was 28.6%. The job category with the highest seroprevalence was the fruit collector with 59.2%. The predominant serovar identified was serovar Sarawak (Lepto 175) (62%).

Conclusion: A high seroprevalence of leptospiral antibodies was detected among oil palm plantation workers and specifically among fruit collectors. The predominant infecting serovar among the workers was serovar Sarawak (Lepto 175). The findings suggest that more studies are needed to determine the reasons for the high seroprevalence and the transmission and pathogenicity of the local serovar Sarawak (Lepto 175).

1. Introduction

Leptospirosis is a potentially fatal bacterial infection recognized as a zoonotic spirochetal disease. The disease is also considered as a re-emerging global public health issue of worldwide importance, especially in tropical and subtropical countries. The exact number of human cases in the world is not precisely known because of the lack of surveillance data worldwide [1]. Recent data have shown that Malaysia is an endemic country for leptospirosis, with an increased number of

reported cases and outbreaks and a significant number of deaths over the past decade [2,3]. The prevalence of leptospirosis in Malaysia increased from 2004 to 2009, and the case fatality rate within that period varied from 1.8% to 7.6% [4].

Leptospirosis is transmitted to humans through skin or the mucous membrane coming into contact with water, moist soil, vegetation, or environmental surfaces contaminated with the urine of an infected animal. Symptomatic leptospirosis usually manifests itself as a range of diseases from a flu-like illness to Weil's

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syndrome, with the case fatality rate ranging from 5% to 15%, and is characterized by jaundice, renal failure, and hemorrhage [5]. The past outbreaks of leptospirosis in developed countries were often related to recreational activities, whereas these outbreaks tended to be seasonal in nature, related to animal activities, and related to agricultural and occupational factors in developing countries [6,7]. A recent hospital-based study reported that the majority of leptospirosis cases in Malaysia were among agricultural workers [8].

The palm oil industry is the main agricultural sector in Malaysia, one of the world's main palm oil exporters, and it accounts for 77% of the total agricultural land and has become the fourth largest contributor to the Malaysian economy [9,10]. The available data show that the palm oil industry in Malaysia is a major sector of employment, with the industry supporting more than 1.4 million jobs and 468,056 people hired as field workers in plantations [10,11].

2. Materials and methods

2.1. Study design and population

A cross-sectional study was conducted in June 2014 involving 10 oil palm plantations in Melaka and Johor, which are southern states of Malaysia. The study was granted ethical approval by the Research and Ethics Committee (Human), School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Kota Bharu, Malaysia. All the workers involved voluntarily signed the informed consent form after they were given a detailed explanation about the procedure and adequate time to make a decision.

Oil palm plantation workers have seven job categories: (1) fruit collector; (2) harvester; (3) pruner; (4) pesticide applicator; (5) fertilizer applicator; (6) driver; and (7) nursery worker.

Calculated based on a 32.6% seroprevalence of leptospirosis among oil palm workers [12], 95% confidence interval (CI) and 10% nonresponse rate, the estimated sample size required for the study was 374. The sampling frame consisted of workers who had been working in the plantation for more than 6 months. Office workers were excluded.

2.2. Blood samples and serologic tests

The consenting respondents were interviewed for sociodemographics, job category, and duration of employment. Venous blood samples were tested for the presence of antileptospiral antibodies using microscopic agglutination test (MAT) at the Institute of Medical Research (IMR) following standard methods [13]. The MAT was performed with a panel of live leptospire reference cultures obtained from the Royal Tropical Institute (World Health Organization/Food and Agriculture Organization of the United Nations

Collaborating Centre for Reference and Research on Leptospirosis) in Amsterdam, The Netherlands (Australis, Autumnalis, Bataviae, Canicola, Celledoni, Grippotyposa, Icterohaemorrhagiae, Javanica, Pomona, Pyrogenes, Hardjoprajitno, Patoc, Tarassovi, and Djasiman) and from the IMR (Melaka, Terengganu, Sarawak, Lai, Hardjobovis, and Copenhageni).

Live leptospire cell suspensions representing 20 serovars were added to serially diluted serum specimens in 96-wells microliter plates and were incubated at 30°C for 2 hours. Through dark field microscopy, agglutination was examined at a magnification of 100 times. Using the control well for comparison, agglutination was examined by observing free leptospire in each well. The MAT were considered positive if the free leptospire approximate numbers were < 50% in the control well. A titer of $\geq 1:100$ was used as the cut-off titer for leptospirosis seropositive in this study. The level of titer indicated previous exposure to the leptospira bacteria [3].

2.3. Statistical analysis

Data were entered and analyzed using IBM SPSS version 22 for Windows [14]. All continuous variables were described using means and standard deviations. Frequencies and percentages were presented for categorical variables. Seroprevalence of leptospirosis was described with a 95% CI.

3. Results

Among the 374 total respondents recruited, there were 350 participants in this study, resulting in a response rate

Table 1. Sociodemographic characteristics of the respondents ($n = 350$).

Variables	Frequency (%)	Mean (SD)
Age (y)		31.4 (9.68)
Sex		
Male	296 (84.6)	
Female	54 (15.4)	
Citizenship		
Malaysian	65 (18.6)	
Non-Malaysian	285 (81.4)	
Marital status		
Married	229 (65.4)	
Single/widower	121 (34.6)	
Income		
<RM1,000	135 (38.6)	
RM1,000–2,000	201 (57.4)	
>RM2,000	14 (4.0)	
Education		
No formal education	101 (28.9)	
Primary school	144 (41.1)	
Secondary school	105 (30.0)	

RM = Malaysian Ringgit.

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