

Comparative study of seroprevalence of toxoplasmosis between local workers and migrant workers in Malaysia

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Abstract

Introduction: It is known that toxoplasmosis primary infection is usually subclinical, but in severely immunocompromised patients it may be life-threatening. To monitor the situations related to non-notifiable diseases among foreign arrivals to Malaysia, a survey on toxoplasmosis was undertaken.

Material and methods: A serological study to determine *Toxoplasma gondii* IgG and IgM antibodies among 501 migrant males and 198 local male workers was conducted in a plantation and a detention camp in Selangor, Malaysia using subjects' venous blood samples for serological study and subjects' study sheet for demographic data collection.

Results: The age of studied samples ranged from 19 to 45 years (geometric mean 29.9). The highest prevalence rate of 46.2% is demonstrated among Nepalese workers. Statistical analysis indicated that the IgG positive rate of the local residents was significantly higher than that of the migrants studied in this survey ($p < 0.05$). IgM positive rate, however, did not show any significant difference between the two groups ($p > 0.05$). No significant difference in the prevalence rates was noted among the migrants or local workers when they were grouped according to agricultural and non-agricultural occupations ($p > 0.05$).

Conclusions: The continuous introduction of these infections may, in the long term, influence the epidemiology and further compromise the efforts in control and prevention. It is therefore pertinent to monitor the situations related to non-notifiable diseases.

Key words: *Toxoplasmosis*, migrants, seroprevalence.

Introduction

Toxoplasma gondii is a protozoan parasite that is endemic worldwide and is a major opportunistic pathogen in immunocompromised hosts. Infection is mainly acquired by ingestion of food, water or soil that is contaminated with oocysts shed by cats, or by eating undercooked or raw meat containing tissue cysts [1]. Primary infection is usually subclinical, but in severely immunocompromised patients it may be life-threatening. Most primary infections subsequently phase into chronic infections in which the parasite persists in tissue cysts, mainly in the brain, retina, and skeletal and cardiac muscle [2]. These chronic infections probably persist indefinitely throughout life and may remain undiagnosed until or unless it is reactivated as a result of severe immune suppression [3].

For the diagnosis of *T. gondii* infection, detection of the organism itself is confirmative but very difficult. Thus, most clinical laboratories use

serological tests to detect antibodies against *T. gondii* such as the latex agglutination (LA) test, ELISA and indirect fluorescent antibody test because of its high specificity and sensitivity [4].

Seroprevalence in different populations may vary according to different environments, social customs and habits [5, 6]. Analysis of worldwide reports indicated that, on average, about 38.5% of humans, 32.9% of cats and 24.2% of goats were seropositive for toxoplasmosis [7-9].

The aim of this study was to survey *toxoplasmosis* among foreign migrants to Malaysia. The arrival of migrant workers in Malaysia since the 1980s has raised the concern that some formerly unknown diseases may be inadvertently brought into the country. This is evident from the documented findings of imported non-endemic diseases, such as Kala Azar and taeniasis [10, 11]. Although most of the identified infections were also endemic in the country, the continuous introduction of these infections may, in the long term, influence the epidemiology and further compromise the efforts in control and prevention.

Material and methods

Type of study and sampling

The type of the study was cross-sectional observational. Random sampling method was used for subjects involved in this study.

Study site and subjects

An isolated oil palm plantation (where the legal migrants have been for an average period

of 3.5 years) with rural setting and a detention camp (where the illegal migrants joined within the past 6 months) located at the fringes of rubber plantations and orchards were selected as the sites for undertaking the present study. The survey involved 501 migrant male workers from different Asian countries. For comparison, the study included 198 local Malaysian male workers who are living and working in the plantation where the survey was conducted and Malaysian police and immigration personnel serving in the detention camp.

Data collection and analysis

The seroprevalence study was conducted on sera from a single collection of blood samples. After separation, the serum was heat-inactivated at 56°C for 30 min, and followed by clarification by centrifugation. The samples were initially screened for *Toxoplasma* IgG antibody by the immuno-fluorescent antibody test (IFAT). A significant titre was defined as 1 : 64 and above. Positive samples were further titrated at two-fold dilutions to determine the end-point values. All serum samples were also tested for IgM antibody by captured enzyme-linked immunosorbent assay (ELISA). The samples were diluted to 1 : 100. The absorbance of the wells was read within 15 min from the end of the assay at 450 nm against the reference wavelength at 620 nm.

Demographic information was gathered by using a study subject information sheet. The variables included; age, country of origin, status of entry to Malaysia and occupation. Verbal consent was taken from all subjects participating in this study. Institutional permission was obtained before starting our study. Statistical analyses were conducted by using SPSS version 10.0 for Windows 2004. Chi-square test for significance at 95% confidence level and *p* value of less than 0.05 was considered statistically significant.

Results

Regardless of their countries of origin, the overall distribution of *Toxoplasma* IgG and IgM antibodies among the migrants is comparable to that

Table I. Comparison of IgG and IgM positive rates between migrant and local workers in the host country

Study subjects	Total number of samples	IgG-positive Number (%)	IgM-positive Number (%)
Migrants	501	171 (34.1%)	26 (5.2%)
Locals	198	89 (44.9%)	17 (8.6%)
<i>P</i> value		0.009	0.17
95% CI		-0.189 to -0.031	-0.069 to 0.009

Table II. IgG titres of the studied subjects who tested positive for toxoplasmosis

Group	IgM and IgG + ve		IgG + ve only		
	Number	IgG titres range/mode	Number	IgG titres range/mode	
Migrants	Plantation	17 (13%)	32-4096, 64	47 (87%)	64-4096, 64
	Camp	14 (12%)	64-6096, 512	98 (84%)	64-4096, 64
Locals	Plantation	6 (13%)	256-2048, 1024	40 (83%)	64-1024, 512
	Camp	6 (15%)	64-4096, 256	32 (78%)	64-2048, 64

There were some cases for which IgG titres were not done

of the local residents. Statistical analysis indicated that IgG positive rate of the local residents is indeed significantly higher than that of the migrants studied in this survey ($p = 0.009$). IgM positive rate, however, does not show any significant difference between the two groups ($p = 0.179$) (Table I).

Table II shows the IgG titres of the studied subjects who tested positive for toxoplasmosis. The distribution of antibodies among the migrant subjects is further grouped according to their countries of origin (Table III). Although IgG positive rate is high among the African and Nepalese migrants, there is no significant difference when compared with that of local workers ($p = 0.189$, $p = 0.910$).

To investigate any possible relationship between the acquisition of toxoplasmosis and occupations, the illegal migrants were grouped according to their occupational activities prior to arriving in the host country or before being detained in the detention camp. A majority of these migrants were involved in farming activities in their home countries, with the rest in non-agricultural activities. As the legal migrant workers had been in the plantation for about 3.5 years on average, their occupations were defined according to the nature of work at the time when the survey was undertaken. For the purpose of this investigation, occupations that involved agricultural activities included planting, harvesting, weeding and general maintenance of the plots. Workers involved in agricultural activities are more liable to become contaminated with cats' faeces. Non-agricultural occupations essentially included activities in processing and production in the oil palm mills, and other general jobs. Statistical analysis did not establish a significant difference in the infection rates between those who worked in the field and those who engaged in non-agricultural activities (Table IV).

Discussion

Although in East and Southeast Asia seroprevalence rate of *T. gondii* infection is generally lower than that reported from Europe and the Americas [12, 13], the results of the present study indicate that toxoplasmosis is a common finding among migrants to this country. There is variation in prevalence rates among migrants from different countries of origin, which is most probably due to differences in dietary habits, behavioural risks, environmental conditions, socioeconomic strata and standards of hygiene.

In this study, the overall seroprevalence rate of toxoplasmosis IgG in the Malaysian local subjects is 44.9%. As it is not a common practice among the locals to consume raw or undercooked meat, it is more likely that the infection was acquired through the ingestion of mature *T. gondii* oocysts

shed by the infected reservoirs. The majority of the local subjects of the present study were born and raised in the same plantation isolated from the outside. The continuous transmission and re-exposures to infection in the 'closed' environment may have contributed to the higher prevalence rate noted in our study. The prevalence rates deduced from the present survey therefore may not be considered as representative of the general population.

Although all three detained migrants from Africa were found to have harboured the infection, the small sample size did not permit further interpretation of the result pertaining to this group of migrants. The different countries of origin of these three migrants also prevented a meaningful conclusion from being established.

A high seroprevalence rate of 46.2% is found among Nepalese workers. The major contributing factor to such high prevalence is attributed to the habitual ingestion of minced raw meat or insufficiently cooked meat by some ethnic groups [14].

Toxoplasmosis is one of the frequently observed food-borne diseases reported in Indonesia, with the proportion of seropositive cases as high as 75% of the animals examined in 12 provinces in 1991 [15].

The negative findings among workers from Sri Lanka may be due to religious causes since they are

Table III. Distribution of *Toxoplasma* IgG and IgM antibodies according to countries of origin

Countries of origin	Total number of samples	IgG-positive Number (%)	IgM-positive Number (%)
Africa	3	3 (100.0%)	0 (0.0%)
Nepal	26	12 (46.2%)	3 (11.5%)
Indonesia	336	138 (41.07%)	20 (5.9%)
Myanmar	22	7 (31.8%)	3 (13.6%)
Bangladesh	45	7 (15.5%)	0 (0.0%)
India	45	3 (6.7%)	0 (0.0%)
Pakistan	17	1 (5.9%)	0 (0.0%)
Sri Lanka	3	0 (0.0%)	0 (0.0%)
Thailand	3	0 (0.0%)	0 (0.0%)
China	1	0 (0.0%)	0 (0.0%)
Malaysia	198	89 (44.9%)	17 (8.6%)

Table IV. Samples that tested positive for toxoplasmosis antibodies in relation to occupations of migrant and local worker study subjects

	Agri culture	Non-agri culture	P value	95% CI
Legal migrants	41 (29.1%)	13 (21.7%)	0.31	-0.054 to 0.214
Illegal migrants	55 (46.2%)	62 (34.3%)	0.06	0.007 to 0.233
Local workers	31 (55.4%)	58 (44.6%)	0.80	-0.163 to 0.263
Total	127 (18.2%)	133 (19.0%)	0.96	-0.104 to 0.084

Budi (do not eat meat). On the other hand, negative findings among workers from Thailand and China may be due to the limited number of studied subjects.

As the average duration of stay of the legal workers in the host country was approximately 3.5 years and 6 months for the illegal migrants, the interpretation of this finding was limited by the fact that *Toxoplasma* IgM may last from about 5 months to 5 years. It was uncertain whether these migrant workers acquired the infection in the plantation or the infection was acquired in their home countries where the infection was also prevalent. Although IgG titres generally decline 6 to 8 weeks after the initial infection of *T. gondii*, some studies have shown that IgG levels are maintained at a high level, with or without declining IgM antibodies [16, 17]. The significantly high titres in some of these workers suggested a recent re-exposure to the infection. This finding substantiated the indication that transmission occurred in the plantation. These observations may hint at the likelihood that toxoplasmosis was being transmitted more frequently in the living quarters where the illegal migrants were being housed than it was outside.

The nature of occupations is known to pose a risk to infection by *T. gondii*. However, the results of the present study did not indicate any significant difference in the prevalence rates between those who were engaged in agricultural and non-agricultural occupations. This may be due to the fact that non-agricultural workers may not be directly involved in agricultural pursuits, but the confinement to the same environment where *toxoplasmosis* is being actively transmitted would have subjected them to the same risk factors. The author did not have the opportunity to study non-occupational risk factors. There was no chance to do a follow-up study for dietary habits, behavioural risks, environmental conditions, socioeconomic strata and standards of hygiene. Future study of toxoplasmosis in any community should analyse in more detail other important risk factors that influence the transmission of the disease.

In conclusion, the results showed that toxoplasmosis was common among the migrant workers from different Asian countries. Statistical analysis did not establish a significant difference in the infection rates between those who worked in the field and those who engaged in non-agricultural activities. Our data demonstrating high frequency of infection among the migrants support the conclusion that continuous introduction of these infections may, in the long term, influence the epidemiology and further compromise the efforts in control and prevention.

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