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SEROPREVALENCE OF TOXOPLASMOSIS AMONG MIGRANT WORKERS FROM DIFFERENT ASIAN COUNTRIES WORKING IN MALAYSIA

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Abstract. A serologic study of Toxoplasma antibodies among 501 foreign migrant workers in Malaysia was conducted in a plantation and detention camp. The highest prevalence rate of 46.2% was among Nepalese workers. Statistical analysis indicated the IgG positivity rate among local residents was significantly higher than the migrants studied (p<0.05). The IgM positivity rate showed no significant difference between the two groups (p>0.05). No significant difference in the prevalence rate was noted between the migrants and the local workers when grouped by agricultural and non-agricultural occupations (p>0.05). The continuous introduction of these infections may influence the epidemiology and further compromise efforts in control and prevention. It is therefore important to monitor of non-notifiable diseases.

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 (Fayer et al, 2004). Primary infection is usually subclinical, but in severely immunocompromised patients it may be life-threatening, (Montoya and Liesenfeld, 2004). 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 their high specificity and sensitivity (Fan et al, 2006).

Seroprevalence in different populations may vary according to differences in environment, social customs and habits (Gibson and Coleman 1958; Conrad et al, 2005). Analysis of worldwide reports indicates about 38.5% of humans, 32.9% of cats, and 24.2% of goats were seropositive for infection (Samad and Begum, 1990; Dubey et al, 2006). Most primary infections become chronic infections in which the parasite persists in tissue cysts, mainly in the brain, retina, skeletal and cardiac muscles (Ho-Yen, 2005). In immunologically competent hosts, asymptomatic infection may remain undiagnosed until or unless it is reactivated as a result of severe immune suppression (Pradhan et al, 2007).

The arrival of migrant workers to 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 im-
ported non-endemic diseases, such as kala
erz (Hamidah et al, 1995) and taeniasis (Che
Ghani and Fatmah, 1996). The results of a re-
cent survey of parasitic diseases among mi-
grant workers showed a high prevalence of
other non-notifiable infections, including toxo-
plasmosis (Personal observations). For this
reason a survey of toxoplasmosis among for-
eign arrivals was undertaken.

MATERIALS AND METHODS

Study site and subjects
An isolated oil palm plantation in a rural
setting was selected as the study site. The
various areas of the plantation are linked by
well-maintained dirt roads. There is no readily
accessible public transport to the outside. The
basic medical needs of the residents taken
care of by a health clinic maintained by the
employers. The survey involved 501 foreign-
ers, some of whom had been issued permits
government authorities to work on the plan-
tation and some had entered the country with-
out legal papers. They were randomly selected
from a detention camp located at the fringes
of the rubber plantation. For comparison, the
study included 198 local Malaysian workers
(90 living and working on the plantation where
the survey was conducted and 108 police and
immigration personnel serving at the deten-
tion camp).

Serologic studies
A 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 minutes, and
followed by clarification by centrifugation. The
samples were initially screened for Toxoplasma
IgG antibody by the immunofluorescent anti-
body test (IFAT). A significant titer was defined
as 1:64 and above. Positive samples were fur-
ther titrated at two-fold dilutions to end-point.

All serum samples were also tested for
IgM antibody by captured enzyme-linked
immunosorbant assay (ELISA). The samples
were diluted to 1:100. Absorbance of the wells
was read within 15 minutes of the end of the
assay at 450 nm against the reference wave-
length at 620 nm. Statistical analyses were
borne out by using chi-square for significance
at a 95% confidence level.

RESULTS

Regardless their countries of origin, the
overall distributions of Toxoplasma IgG and
IgM antibodies in the migrants were compared
to the local residents. Of the 501 migrants
examined, 171 (34.1%) were found positive
for IgG, and 26 (5.2%) were positive for IgM.
Among the local residents, the positivity rates
for IgG and IgM were 89 (44.9%) and 17
(8.6%), respectively. Statistical analysis indi-
cates the IgG positivity rate in the local resi-
dents was significantly higher than in the mi-
grants studied (p=0.009). The IgM positivity
rate was not significantly different between the
two groups (p=0.179).

The distribution of antibodies among the
migrant subjects was further grouped accord-
ing to their countries of origin (Table 1).

Table 2 shows the IgG titers for the sub-
jects testing positive for toxoplasmosis. Both
the illegal migrants and the local subjects had
median titer of 256, whereas the legal migrant
workers had a slightly lower median titer of
192. In all three study groups, the mode titers
were set at 64, and all positive readings were
in the 64 to 4,096 range. Comparatively high
median titers were noted among the illegal mi-
grants from Bangladesh (3 of the serum
samples remained positive at a serum dilution
of 1:1,024) and Myanmar (same mode titer
was observed in 3 of the seven IgG-positive
migrants). All three Africans and 4 Nepalese
were positive for toxoplasmosis at a serum di-
lution of 1:2,048.

To investigate any possible relationship
between the acquisition of toxoplasmosis and
occupation, the illegal migrants were grouped according to their occupational activities prior to arriving in Malaysia or before being detained in the detention camp. A majority of these migrants were involved in farming activities in their home countries, while the rest were in non-agricultural activities (data not shown). Since 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. Non-agricultural occupations essentially included activities in processing and production in the oil palm mills, and other general jobs like transportation, repair and maintenance. Statistical analysis did not establish a significant difference in infection rates between those who worked in the field and those who engaged in non-agricultural activities (p>0.05), (Table 3). Similarly, no significant difference in infection rates was observed between the local workers in agricultural and non-agricultural activities in the same place (p>0.05).

Table 1
Distribution of Toxoplasma IgG and IgM antibodies by country of origin.

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Number of samples</th>
<th>IgG-positive</th>
<th>IgM-positive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (%)</td>
<td>Number (%)</td>
<td>Number (%)</td>
</tr>
<tr>
<td>Africa</td>
<td>3</td>
<td>3 (100.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Nepal</td>
<td>26</td>
<td>12 (46.2)</td>
<td>3 (11.5)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>336</td>
<td>138 (41.1)</td>
<td>20 (5.9)</td>
</tr>
<tr>
<td>Myanmar</td>
<td>22</td>
<td>7 (31.8)</td>
<td>3 (13.6)</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>45</td>
<td>7 (15.5)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>India</td>
<td>45</td>
<td>3 (6.7)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Pakistan</td>
<td>17</td>
<td>1 (5.9)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>3</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Thailand</td>
<td>3</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>China</td>
<td>1</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Malaysia</td>
<td>198</td>
<td>89 (44.9)</td>
<td>17 (8.6)</td>
</tr>
</tbody>
</table>

Table 2
Distribution of Toxoplasma IgM in relation to IgG among migrants and locals.

<table>
<thead>
<tr>
<th>Group</th>
<th>IgM and IgG +ve</th>
<th>IgG +ve only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>IgG titer range/ mode</td>
</tr>
<tr>
<td>Migrants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plantation</td>
<td>7 (13%)</td>
<td>32-4,096, 64</td>
</tr>
<tr>
<td>Camp</td>
<td>14 (12%)</td>
<td>64-6,096, 512</td>
</tr>
<tr>
<td>Locals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plantation</td>
<td>6 (13%)</td>
<td>256-2,048, 1,024</td>
</tr>
<tr>
<td>Camp</td>
<td>6 (15%)</td>
<td>64-4,096, 256</td>
</tr>
</tbody>
</table>

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DISCUSSION

The results of the present study show that nearly all nationalities examined for Toxoplasma antibodies were seropositive. In East and Southeast Asia, the seroprevalence of T. gondii infection is generally lower than that reported in Europe and the Americas (Bhatia et al., 1974; Dubey, 1994; Sukthana, 2006). The variations in prevalence rates among migrants from different countries of origin are most likely due to differences in dietary habits, behavioral risks, environmental conditions, socioeconomic status and hygiene.

Although all three migrants from Africa were found to harbor infection, the small sample size does not permit extrapolation of results to other African migrants. The different countries of origin for these three migrants also prevent a meaningful conclusion from being established (data not shown).

A high seroprevalence rate (46.2%) was found among Nepalese workers. In 1999, Rai et al. found 65.3% of inhabitants studied in western Nepal were positive for toxoplasmosis. The major contributing factor to such a high prevalence was attributed to the habitual ingestion of minced raw meat or insufficiently cooked meat by some ethnic groups.

Toxoplasmosis is one of the most frequently observed food-borne diseases reported in Indonesia, with as many as 75% of animals examined in 12 provinces in 1991 being seropositive (Kusharyono and Sukartinah, 1991). In our study, the seroprevalence rate was 54.4% among illegal Indonesian workers.

The negative findings among workers from Sri Lanka may be due to religious reasons since they are Budi (vegetarian). On the other hand, the negative findings among workers from Thailand and China may be due to the small number of studied subjects.

Since IgG titers generally decline 6 to 8 weeks after the initial infection with T. gondii, the significantly high titers in some of these workers suggests a recent exposure to the infection. This finding supports the theory that transmission occurred on the plantation. These observations hint at the theory that toxoplasmosis is transmitted more frequently in the living quarters of illegal migrants than it was to those being housed outside.

Certain occupations pose a higher risk for infection with Toxoplasma gondii. In a study by Rai et al (1999), it was noted that a higher prevalence was found among those engaged in agricultural activities where exposure to cat feces was not uncommon. However, the results of the present study on the plantation 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 although non-agricultural workers were not

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Migrants</th>
<th>Local workers</th>
<th>Total workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Positive</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>tested</td>
<td>samples</td>
<td>tested</td>
</tr>
<tr>
<td>Agriculture</td>
<td>260</td>
<td>96 (36.9%)</td>
<td>56</td>
</tr>
<tr>
<td>Non-agriculture</td>
<td>241</td>
<td>75 (31.1%)</td>
<td>142</td>
</tr>
<tr>
<td>p-value</td>
<td>0.18</td>
<td>0.07</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Table 3
Samples testing positive for toxoplasmosis antibodies in relation to occupations of the migrants and local workers.
directly involved in agricultural pursuits, they were confined in the same environment where toxoplasmosis is being actively transmitted, which would subject them to the same risk for infection.

ACKNOWLEDGEMENTS

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