

Seroprevalence and Sources of Toxoplasmosis among Orang Asli (Indigenous) Communities in Peninsular Malaysia

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Abstract. This study aims to evaluate the current seroprevalence of toxoplasmosis among indigenous communities in Peninsular Malaysia and relate its association with epidemiological data. Overall seroprevalence of *Toxoplasma gondii* was 37.0% with 31.0% immunoglobulin (Ig) G, 1.8% IgM, and 4.2% seropositivity for both anti-*Toxoplasma* antibodies. Multivariate analysis showed that age above 12 years (odds ratio [OR] = 2.70, 95% confidence interval [CI] = 1.75–4.04, $P < 0.001$), using untreated river and mountain water supplies (OR = 1.50, 95% CI = 1.01–2.40, $P = 0.050$), and close proximity with cats (OR = 1.40, 95% CI = 1.10–1.76, $P = 0.010$) were factors associated with toxoplasmosis. Given the high seroprevalence of toxoplasmosis among these communities who live in poor socioeconomic conditions, a comprehensive health surveillance program and screening should be initiated among women of childbearing age and pregnant women during the antenatal period for early diagnosis and treatment. The role of domestic cats and environmental contamination with oocyst in soil and water has to be highlighted and addressed in future prevention strategies for these communities.

INTRODUCTION

Human toxoplasmosis is a zoonotic infection caused by the obligate intracellular protozoan parasite *Toxoplasma gondii*. Approximately one-third of the world population is estimated to be infected with *T. gondii*.¹ There are various ways in which humans acquire toxoplasmosis, and these ways include ingestion of contaminated raw meats with tissue cysts of *Toxoplasma*, ingestion of vegetables or water contaminated with infected cat feces, blood transfusion, organ transplantation, and congenital acquisition of infection. Acquired toxoplasmosis is generally asymptomatic, whereas clinical toxoplasmosis may present in different forms. The most common manifestation of acute acquired toxoplasmosis is lymphadenopathy, and the illness may resemble the flu and is self-limited. Besides these factors, ocular toxoplasmosis may cause chorioretinitis, and this usually follows congenital infection. Another form primarily involves the brain and is usually seen in immunocompromised populations, particularly acquired immunodeficiency syndrome (AIDS) patients. Significantly, toxoplasmosis may cause serious complications in fetuses of infected pregnant mothers² and in immunocompromised patients who have undergone solid organ transplants³ or have human immunodeficiency virus (HIV)/AIDS.⁴

In Malaysia, the prevalence rate of toxoplasmosis in the general population was reported to be at 28.1% in 2002.⁵ Seroprevalence of toxoplasmosis among HIV/AIDS patients was higher, with rates recorded at 51.2% ($N = 406$)⁶ and 44.8% ($N = 505$).⁷ However, information on toxoplasmosis among the indigenous groups in Peninsular Malaysia has been very limited. The last available information on the distribution of anti-*Toxoplasma* antibodies among the indigenous people (Orang Asli) in Malaysia was in 1994.⁸ Of 415 serum samples collected and tested by indirect fluorescent antibody (IFA) test, 10.6% were seropositive.⁸ Given that the indigenous communities are unique compared with the general population because of their distinct living lifestyles, educational backgrounds, and environ-

mental characteristics, therefore, this study was carried out to determine the current seroprevalence of toxoplasmosis among the indigenous communities as well as to assess the association between the risk factors with *Toxoplasma* seropositivity. This study is significant in providing the most current epidemiological data of toxoplasmosis among these minority communities besides enhancing the understanding of potential risk to which they are exposed. With improved knowledge, effective preventive measures can be instituted and implemented.

MATERIALS AND METHODS

Study population. The study was carried out from November 2007 to October 2010 among various Orang Asli (indigenous) subgroups living in Peninsular Malaysia. The Orang Asli constitutes the minority people who live in the closest possible association with tropical forest of the lowlands and hills of Peninsular Malaysia. Despite their small number, they are not homogenous, because each group has its own language and culture; most importantly, they perceive themselves as different from the others. There are three major groups (Negrito, Senoi, and Proto-Malay), and each group is also divided into six subgroups, totaling 18 distinct cultural linguistic groups. Their population grew from 54,033 in 1969 to 92,529 in 1994 at a rate of almost 2.3% per year.⁹ In 2004, according to the latest available records of the Department of Orang Asli Affairs, there were a total of 147,412 Orang Asli, representing a mere 0.6% of the national population, living in 869 villages.⁹ Of these, seven subgroups, including Temuan Selangor, Semai Perak, Semai Pahang, Mah Meri, Semelai, Temiar, and Orang Kuala, from five different states have voluntarily participated in this study (Figure 1). The study included 495 eligible Orang Asli individuals who gave informed consent before this study. The villages and the selection of the study participants have been described in a different study.¹⁰

Information collection. Information on sources of infection and environmental characteristics was collected by means of a questionnaire together with blood samples. A pre-coded and pre-tested questionnaire designed to detect sociodemographic and biologically plausible risk factors associated with toxoplasmosis, clinical history, and presenting signs and symptoms related to toxoplasmosis (if any) was used

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