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The potential risk factors for toxoplasmosis in balinese pregnant women-indonesia



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ABSTRACT

Background: *Toxoplasma gondii* is an obligate intracellular protozoan that causes a zoonotic disease which is dangerous if suffered by immunodeficient patients or pregnant women. Primary infection in pregnant women can cause abortion, intra uterine fetal death (IUFD) or birth defects. The aim of the study was to determine the prevalence of antibodies to *T. gondii* among pregnant women in Badung regency, Bali and identify potential risk factors for infection.

Methods: Between July and October 2013, 330 pregnant women were surveyed and tested for IgG antibodies to *T. gondii* by ELISA test, and risk factors were calculated.

Results: Thirty-six women (10.9%) were positive for *T. gondii* antibodies. The prevalence of antibodies to *T. gondii* was found to

be significantly associated with keeping house cats, cleaning up of cat excrement, frequency of consumption of *lawar* (a Balinese dish containing raw meat) and consumption of raw meat.

Conclusions: These results demonstrate that prevalence of *T. gondii* in Balinese pregnant women was high, with identified risk factors being house cat ownership and care, and consumption of raw meat. As many of the pregnant women studied were unaware of the risk factors for toxoplasmosis, a major education campaign, promoting healthy life style choices for primary prevention of *T. gondii* infection, is needed in Bali.

Keywords: *Toxoplasma gondii*, ELISA, risk factors, *lawar*, pregnant women.

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INTRODUCTION

Toxoplasmosis is a zoonotic disease caused by the intracellular parasite *Toxoplasma gondii* (*T. gondii*), which can infect humans and other warm blooded animals.¹ The high prevalence of toxoplasmosis has a relationship with its mode of transmission, as it can spread very easily, especially through meat as an animal product. Toxoplasmosis has a worldwide distribution. Cats, including all felines, are the definitive hosts, which excrete environmentally-resistant oocysts in their feces. Toxoplasmosis causes mental retardation and loss of vision in congenitally-infected children and abortion in pregnant women and livestock.² It is therefore of public health significance in many places.

Several studies have shown that prevalence and transmission of *T. gondii* is higher in pregnant woman who consume undercooked or raw meat or have contact with felines.^{3,4,5} Consuming undercooked infected meat and contact with felines are thus risk factors for toxoplasmosis in pregnant woman in Colombia, Taiwan and Southern China. No information is available to date for pregnant woman in Indonesia.

The prevalence of antibodies to *T. gondii* reported in Indonesia ranges from 3.1% to 70%,^{6,7,8,9} but these studies did not focus on pregnant women, perhaps the most important group at risk of negative

outcomes from infection. Epidemiological study has suggested that eating habits are important risk factors for the *Toxoplasma* infection in humans, especially consuming satay with undercooked meat,¹⁰ and consuming a special dish (*Lawar*) in Bali.⁶ *Lawar* is a Balinese traditional food made from a mixture of vegetables and raw meat. Similarly, Choi et al reported that an outbreak of toxoplasmosis in eight people in Korea was related to consuming undercooked pork.¹¹

The risk factors that are often associated with acute infection in pregnant women are eating raw or undercooked meat, soil contact, eating salami, drinking unpasteurized milk and animal contact.¹ However no report has been published to date on the prevalence of *T. gondii* in pregnant women in Bali, although previously reported risk factors for toxoplasmosis are present, including many house cats and particular eating habits of consuming undercooked or raw meat. In addition, previous studies have not considered details of cat care that could affect exposure, and in particular the cleaning up of cat excrement.

The present study aimed to survey seroprevalence of *Toxoplasma gondii* in pregnant women in Badung regency, Bali, Indonesia, to collect data on life style factors of the women likely to contribute

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to infection profiles, including ownership and care of house cats, and to identify which of the lifestyle factors are potential risk factors for toxoplasmosis in pregnant woman in Bali.

MATERIALS AND METHODS

Participant selection and questionnaire administration:

The subjects in the present study were chosen from a rural area in Badung regency, a location where toxoplasmosis has been frequently identified. Badung regency has a well-organized health care system called Public Health Centers (PUSKESMAS), in which pre- and post-natal care and birthing support are provided by trained midwives. A total of 330 pregnant women from 25 midwives were studied from July 2013 to October 2013 in order to have representation from all geographical areas and socio-economic strata in Badung regency.

A questionnaire was administered through personal interviews by a team of postgraduate students of public health from Udayana University, to collect information that included age, occupation, food habits, personal hygiene, household facilities and pet keeping (Appendix 1). We classified the pregnant women into three age groups for analysis: 17-19 years, 20-29 years and 30-40 years.

Blood sample collection and analysis

A single blood sample was collected from each of the pregnant women by their PUSKESMAS midwife and stored at 4°C. Serum samples were obtained by centrifugation at room temperature at 3000 rpm for 5 minutes and stored at minus 20°C until use. Serum specimens were tested by ELISA to detect

anti-*Toxoplasma* IgG and antibodies using Bioelisa TOXO IgG (Biokit, Spain) according to the manufacturer's instructions. A negative reaction indicates absence of significant *Toxoplasma* antibodies. A positive *Toxoplasma* IgG reaction was interpreted as an indication of either a past or current infection.

Statistical analysis

Questionnaire data were tabulated and submitted to a descriptive statistical analysis. The Chi-square test was used to analyze linear trends of seroprevalence; $p < 0.05$ were considered to be statistically significant. Statistical analysis was performed using SPSS version 16.

RESULT

Serum samples from the 330 pregnant women (average age 27 years) were examined for *T. gondii*. Thirty-six women (10.9%) were seropositive for IgG to *T. gondii* as determined by the ELISA test.

The seroprevalence of *T. gondii* infection in the pregnant women according to age group is shown in Table 1. The seroprevalence was significantly higher

Table 1 Seroprevalence of *T. gondii* infection in pregnant women in Badung regency, Bali, Indonesia stratified by age group

Age group (years)	Total	Percentage (%)
17-19	13	23.1*
20-29	215	12.6
30-40	102	5.9

*Comparison between age group X^2 for linear trend=5.074. ($p=0.024$)

Table 2 Seroprevalence of *T. gondii* infection of pregnant women as associated with keeping house cats and raw meat in diet, and relative risk factors based on multivariate analysis

Variable	Antibodies to <i>T. Gondii</i>		Statistical significance	
	Percent (%)	Number	P	Relative risks (CI 95%)
Keeping house cats				
No	6.1	12	Ref	
Yes	21.2	21	0.000	2.154(1.567-2.961)
Cleaning up excrement of cats				
No	9.4	24	Ref.	
Yes	37.5	9	0.001	4.473(2.129-9.395)
Frequency of consumption of lawar				
Seldom	0	0	Ref.	
Often	11.8	27	0.006	1.224 (1.154-1.298)
Consumption of raw meat				
No	10.2	33	Ref.	
Yes	50	3	0.019	8.168 (1.710-38.958)

in the 17-19 year age group (23.1%) than in the 20-29 year (12.8%) and 30-40 year (5.9%) groups (Table 1), although the number of subjects in this age group was very much lower than in the other groups.

The factors from the survey data that were analysed as potential risks for *T. gondii* infection are as follows: age, gravida, socio economic status, eating habits, and whether they kept house cats or other animals (see appendix). The prevalence of antibodies to *T. gondii* was found to be significantly associated with four factors: keeping house cats ($p < 0.01$), cleaning up of cat excrement ($p < 0.01$), frequency of consumption of *lawar* ($p < 0.01$) and consumption of raw meat ($p > 0.05$) (Table 2).

DISCUSSION

A wide variability in the prevalence of *T. gondii* infection in pregnant women has been reported world wide,¹ but this study is the first epidemiological study of toxoplasma infection in pregnant women in Indonesia. The results obtained are lower than in other studies conducted in developing countries; in Arabia it was 29.4%,¹² in Kolkata, India it was 26%¹³, and in Taiz-Yemen, India was 44%.¹⁴ However, the seroprevalence was higher than found in the UK (7.7%).¹⁵ Possible explanations may relate to differences in culture, socio-economic status, eating habits and hygiene practices.

The other two factors related to diet. Seroprevalence was significantly higher in pregnant Balinese women who frequently consumed the special dish "lawar", and in those who reported eating raw meat, than in those who did not.

The results of the study suggest that the important sources of infection in pregnant women in Bali are owning and cleaning up after house cats, and eating meat containing bradizoites of *T. gondii* (i.e., raw or undercooked meat). Pork is frequently eaten in Bali, and is an important source of infection when undercooked. A recent survey in pigs in Bali revealed that the prevalence of *T. gondii* antibodies was 32%.¹⁹ These results demonstrate that prevalence of *T. gondii* in Balinese pregnant women was high, with identified risk factors being house cat ownership and care, and consumption of raw meat. The interviewers reported anecdotally that most of the pregnant women they spoke to were unaware of the risk factors for toxoplasmosis. Thus, a major education campaign, including promotion of healthy life style for primary prevention of *T. gondii* infection, is needed in Bali, Indonesia.

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