PATTERN OF ANTIBODIES IN TOXOPLASMOSIS OF PREGNANT WOMEN AND THEIR CHILDREN IN THAILAND

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Abstract. The latex agglutination test for toxoplasmosis was performed on 690 blood samples collected from the Veterans and Bang Bua Thong Hospitals in Bangkok. Blood samples were collected in the first- and the third-trimester from pregnant women and from the cord blood. The seroprevalence of toxoplasmosis in the first trimester was 13.14%, 13.60%; in the third trimester was 12.21%, 9.43% and in the cord blood 7.18% and 13.04% for the Veterans Hospital and Bang Bua Thong Hospital, respectively. There was no significant difference between the prevalence of toxoplasmosis for each type of blood from both hospitals. The average prevalence of toxoplasmosis for Thai pregnant women in the first- and third-trimester was 13.38% and 11.41%, respectively, and that for the cord blood was 9.01%. Congenital toxoplasmosis occurred in children of untreated mothers who were seropositive or seronegative in the third-trimester, the infection rates of the fetus being 46.67% and 8.13% respectively.

INTRODUCTION

Toxoplasmosis caused by *Toxoplasma gondii* can lead to congenital abnormalities in infants born to either subclinically or clinically infected mothers.

Toxoplasma gondii in Thailand was isolated first in animals by Sungkasuwan (1965). In man, however, only three confirmed cases were reported based on autopsy findings (Bunyaratvej *et al*, 1978). Previous studies showed that among 221 pregnant women, only 2.3% were found to have positive antibody titers. The women were from Central and Northern Thailand (Nabnien, 1979). In Chiang Mai, 2.8% of 500 pregnant women were found to have positive titers using the indirect hemagglutination test (Morakote *et al*, 1984). However, no study has been done on the prevalence of *T. gondii* infection by determining the antibody levels of mothers and their newborn babies. Toxoplasmosis is increasing as it is one of the complication of the acquired immune deficiency syndrome (AIDS). This study was designed to determine the pattern of antibodies to toxoplasmosis in Thai pregnant women and their babies. It should serve as a baseline for future studies of congenital toxoplasmosis among newborn babies.

MATERIALS AND METHODS

A total 690 blood samples were collected from two hospitals, one located in the Bangkok metropolitan area (Veterans Hospital) and the other located close to a rural slum area (Bang Bua Thong Hospital). Five ml of the blood was collected at the time mothers visited the hospitals for antenatal care or for delivery. The cord blood was taken after delivery. Sera were separated from clotted blood by centrifugation and stored at -70° C.

Toxoplasma antibodies were determined by the latex agglutination test (Toxotest MT "EIKEN", Japan). The test was carried out in U-bottom microtiter plates. Serum samples were diluted two-fold with specific diluent, using the following dilutions: 1:8, 1:16, 1:32, 1:64, 1:128, 1:256, 1:512, 1:1024, 1:2048. The final volume of diluted serum in each well was 200 µl. To each well, 0.025 µl of sensitized latex was added. The plate was covered and shaken by gently tapping all four sides several times to avoid air bubbles and subsequently left at room temperature (27° C) overnight and then read with a minimum of agitation. Readings were made as described by the manufacturer in the package insert. A titer below 1:16 was considered as

negative, 1:16 as false positive and must be repeated, and 1:32 or more as positive. The test was valid only when the positive control titer was 1:128 – 1:512.

RESULTS

The distribution of toxoplasmosis according to time of collection among pregnant women and their newborn infants is shown in Table 1. The positivity rates of samples from the Veterans Hospital were 13.14%, 12.21%, and 7.18%, while those from Bang Bua Thong Hospital were 13.60%, 9.43% and 13.04% for pregnant women during the first-trimester and third-trimester, and from cord blood of the newborn infants, respectively. The titers are shown in Tables 2, 3, 4 and 5. All of the positive cases were subclinical.

DISCUSSION

Pregnant women who visited the Veterans Hospital had higher incomes than those who

Table 1

Distribution of *Toxoplasma gondii* according to time of collection of sera among pregnant women and their new born infants.

Blood samples	Total number of tests		Number of positive		% of positive		average % of positive
	VH	BH	VH	BH	VH	BH	
1st trimester	137	147	18	20	13.14*	13.60*	13.38
3rd trimester	131	53	16	5	12.21*	9.43*	11.41
cord blood	153	69	11	9	7.18*	13.04*	9.01

* Not statistically significant ($p > 0.05$)
VH = Veterans Hospital; BH = Bang Bua Thong Hospital

Table 2

Distribution of latex agglutination titers to *Toxoplasma gondii* in 284 pregnant women at the first-trimester from two hospitals.

Titers	Veterans Hospital		Bang Bua Thong Hospital	
	No. of sera	% of total	No. of sera	% of total
< 1 : 16	119	86.86	127	86.39
1 : 16	0	0	0	0
1 : 32	14	10.22	18	12.25
1 : 64	2	1.46	1	0.68
1 : 128	0	0	1	0.68
1 : 256	2	1.46	0	0
Total	137	100%	147	100%

Table 3

Distribution of latex agglutination titers to *Toxoplasma gondii* in 184 pregnant women at the third-trimester from two hospitals.

Titers	Veterans Hospital		Bang Bua Thong Hospital	
	No. of sera	% of total	No. of sera	% of total
< 1 : 16	115	87.78	48	90.56
1 : 16	0	0	0	0
1 : 32	16	12.22	4	7.55
1 : 64	0	0	1	1.89
Total	131	100%	53	100%

Table 4

Distribution of latex agglutination titers to *Toxoplasma gondii* in 222 cord blood of children from two hospitals.

Titers	Veterans Hospital		Bang Bua Thong Hospital	
	No. of sera	% of total	No. of sera	% of total
< 1 : 16	142	92.82	60	86.96
1 : 16	0	0	0	0
1 : 32	9	5.88	7	10.14
1 : 64	1	0.65	0	0
1 : 128	1	0.65	1	1.45
1 : 256	0	0	1	1.45
Total	153	100%	69	100%

went to the Bang Bua Thong Hospital. However, the prevalence of toxoplasmosis among these women in the first- and third-trimesters and the cord blood was not statistically different (Table 1). This indicates that all of them have equal exposure to *T. gondii* and the source of infection should be equally available in both areas. The main factors involving transmission of human toxoplasmosis in Thailand are obscure. Nabnien (1979) found that 2.7% of stray cats in Central Thailand shed *T. gondii* oocysts and 45% of them were seropositive. In his work, the seroprevalence of antibodies in swine was 20.8%. Morakote *et al* (1984) reported the prevalence of antibodies to *T. gondii* in blood donors who ate raw pork was only 4.6%. In the present study, common foods for both groups of pregnant women were pork, beef, fish, chicken and eggs. These food items may serve as a source of infection. Flies, cockroaches, reptiles, amphibians may serve as transport hosts, and may be responsible for transmission.

The seroprevalence of toxoplasmosis in women in the first-trimester and the third-trimester were similar from both hospitals. These data suggests that lowering of resistance to *T. gondii* during different periods of pregnancy

Table 5

Infection rate of infants based on the cord blood titers to *Toxoplasma gondii* among seropositive and seronegative mothers.

Maternal blood	Titers	Negative	Positive					
		< 1 : 16	1 : 16	1 : 32	1 : 64	1 : 128	1 : 256	IR*
	Negative							
	< 1 : 16	113	0	8	0	1	1	10/123 =
	1 : 16	0	0	0	0	0	0	8.13%**
	Postive							
	1 : 32	8	0	6	1	0	0	7/15 = 46.67%**

* IR = infection rate of infants
** Statistically significant $p < 0.05$

does not occur. Symptomatic toxoplasmosis during pregnancy was not reported in this study and the positive cases gave only low titers (Tables 2, 3, 4, 5). Lower antibody titers to *T. gondii* were also reported in the study of Nabnien (1979) and Morakote *et al* (1984). This is probably because strains that commonly infect man have low antigenicity or the hosts are less susceptible.

The cord bloods from both hospitals were positive for toxoplasmosis (Table 1) and in the study of paired sera (Table 4). The data showed that congenitally-acquired toxoplasmosis in Thai infants occurs in both seropositive and seronegative mothers. The probability of *T. gondii* infection developing in infants born to seropositive untreated mothers during the third-trimester was 46.67% or higher compared to a positive rate of 8.13% among infants with seronegative mothers. This study indicates that the risks of developing infection among infants with seropositive mothers is about 6 times greater compared with infants with seronegative mothers. The degree of risk of infection in the newborns is directly associated with the seropositivity for *T. gondii* in their mothers.

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REFERENCES

Bunyaratvej S, Chaimuangraj S, Pairojkul C, Tanpaichitra D. Human adult toxoplasmosis: Report of three fatal cases. *Southeast Asian J Trop Med Public Health* 1978; 9:288.

Morakote N, Thamasonthi W, Charuchind K, Khamboonruang C. Prevalence of *Toxoplasma* antibodies in Chiang Mai population. *Southeast Asian J Trop Med Public Health* 1984; 15:80-5.

Nabnien K. Seroepidemiological study of toxoplasmosis in the central part of Thailand. Bangkok: Mahidol University, 1979; 89 pp. MS Thesis.

Sungkasuwan V. The first report of toxoplasmosis in animal in Thailand. *J Med Assoc Thai* 1965; 48:793-8.