Rev. Inst. Med. trop. S. Paulo
48(3):167-170, May-June, 2006

BRIEF COMMUNICATION

SEROPREVALENCE OF TOXOPLASMOSIS IN A LOW-INCOME COMMUNITY IN THE SÃO PAULO MUNICIPALITY, SP, BRAZIL

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SUMMARY

Toxoplasmosis is one of the most common zoonoses worldwide. The seroprevalence for *T. gondii* in human population from Brazil might range from 40 to 80%. The aim of this paper was to study the seroprevalence of *T. gondii* infection in children from age one to 15 living in a low socioeconomic community, named community of Jardim São Remo in the year of 2002. The community is located in the West area of São Paulo municipality, São Paulo State, Brazil. Antibodies to *T. gondii* were found in 110 (32.4%, CI 95%: 27.5 - 37.7) of the 339 children tested with indirect immunofluorescent antibody test. The titration of the samples revealed 29 children with serum titer equal to 16, 14 children with 32, 18 children with 64, 21 children with 128, 20 children with 256 and eight children with serum titer ≥ 512. The age dependence of the prevalence of *T. gondii* infection and the association between seroprevalence for *T. gondii* and seroprevalence for *T. canis* suggest that the infection is chiefly postnatal. Seroconversion in infant population of community Jardim São Remo occurs in children as young as two years old, earlier than in the children attended at health centers of São Paulo city. The seroprevalence of *T. gondii* in children from Jardim São Remo was compared to the prevalence in children from other urban centers of Brazil.

KEYWORDS: Toxoplasmosis; *Toxoplasma gondii*; *Toxocara canis*; Seroprevalence; Humans.

Toxoplasmosis, a parasitic disease caused by the tissue cyst-forming coccidium *Toxoplasma gondii*, is one of the most common zoonoses worldwide[12]. Up to one third of the world human population are believed to be infected with the parasite[4]. However, the prevalence of *T. gondii* infection in human populations may vary among different countries, different geographical areas within a country, different socioeconomic status and different cultural habits[12].

Infections by *T. gondii* are usually asymptomatic in immunocompetent hosts but may cause severe consequences in pregnant women and in immunocompromised hosts. If the parasite is transmitted to the fetus, it may cause abortion, neonatal death and fetal abnormalities like hydrocephaly, retinochoroiditis and mental retardation[8].

As in other parts of the world, the seroprevalence for *T. gondii* in Brazil vary greatly depending on a multitude of factors, as those mentioned above, that may have impact on the epidemiology of the infection. The seroprevalence for *T. gondii* in Brazil might range from 40 to 80%[10,11].

In order to get information for the implementation of educational measures for the toxoplasmosis control and prophylaxis, we have studied the seroprevalence of *T. gondii* infection in children from age one to 15 living in a low socioeconomic community, named community of Jardim São Remo, located in the West area of São Paulo municipality, São Paulo State, Brazil.

The community of Jardim São Remo has a total area of 70,000 m^2, a population of 3,912 persons of whom 1,381 are children one to 15 years old. The animal population is composed by 313 dogs and 145 cats. Although being a low socioeconomic community, the locality receives treated water from the public system. The demographic information of the community was obtained by MURADIAN (2002)[7].

This study was approved by the ethical committee of the University Hospital of the University of São Paulo (HU-USP). The HU-USP is the municipal unit responsible for the health of Jardim São Remo population. Each child was given a registration number which was used for random sampling. None of the sampled children or their parents refused to participate in the study. Blood samples

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from 339 children selected at random were collected and sera were separated and stored at -20 °C until tested for anti-*T. gondii* antibodies. The sample size was calculated by using the software Epi Info 6.0 (Centers for Disease Control and Prevention, Atlanta, USA, 2001) based on an estimated prevalence of 0.5, acceptable error of 0.05 and confidence level of 0.95. Indirect immunofluorescent antibody test (IFAT) was used with a cut off value of 1:16. The positives were tested in 2-fold serial dilutions up to 1:512. Tachyzoites of *T. gondii* RH strain were used as antigen, as described elsewhere[2]. Positive and negative serum controls were included on each slide.

The samples had already been tested for the presence of anti-*Toxocara canis* antibodies with a dot-enzyme-linked immunosorbent assay using somatic and excretory-secretory antigens of *Toxocara canis*[7]. The association between the outcomes of the *T. gondii* and *T. canis* serodiagnosis was tested using Chi-square test with statistical significance when $p < 0.05$.

Antibodies to *T. gondii* were found in 110 (32.4%, CI 95%: 27.5 - 37.7) of the 339 children (Table 1), in titers of 16 in 29 children, 32 in 14 children, 64 in 18 children, 128 in 21 children, 256 in 20 children and ≥ 512 in eight children.

The seroprevalence for *T. gondii* in the infant population of the community Jardim São Remo ranges from 5.8% (CI 95%: 1.2 - 16.2) in children one to three years old to 56.0% (CI 95%: 41.3 - 70.0) in those between 13 and 15 years old (Fig. 1). Stratifying the samples by age (from 1 to 3, 4 to 6, 7 to 9, 10 to 12 and 13 to 15), the seroprevalence in Jardim São Remo can be associated to age (Chi-square = 41.56; p = 0.000) (Fig. 1).

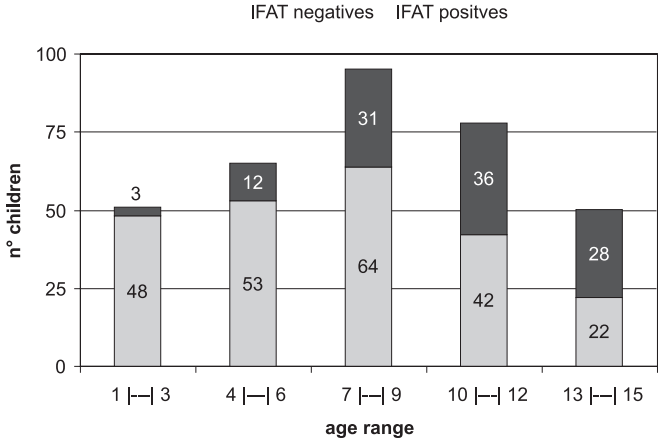

Fig. 1 - Results of indirect immunofluorescent antibody test (IFAT) in serum samples of the children resident in the community Jardim São Remo grouped according to age range, in years.

The population of children studied was also stratified according to socioeconomic parameters of their families. Five categories were created, based on the monthly household income: (i) less than US$ 60.00; (ii) from US$60.00 to US$180.00; (iii) from US$180.00 to US$300.00; (iv) from US$300.00 to US$480.00 and; (v) over to US$480.00. In this case, the seroprevalence of *T. gondii* infection was not associated to the socioeconomic parameters (Chi-square = 1.283; p = 0.864) (Table 2).

The prevalence of *T. gondii* infection starts to rise abruptly in the age range of eight to nine years with seroconversion being observed in children as young as two years (Table 1). Comparing the results of this study with those of JAMRA & GUIMARÃES, (1981)[6] with children living in the metropolitan area of São Paulo, the seroprevalence in São Remo is higher in almost all age ranges.

Table 1
Results of indirect immunofluorescent antibody test (IFAT) in serum samples of the children resident in the community Jardim São Remo

Age[1]	IFAT result[2]		Total[3]
	Negative	Positive	
1	5	0 (0%)	5
2	18	1 (5.3%)	19
3	25	2 (7.4%)	27
4	16	1 (5.9%)	17
5	23	7 (23.3%)	30
6	14	4 (22.2%)	18
7	29	8 (21.6%)	37
8	24	12 (33.3%)	36
9	11	11 (50.0%)	22
10	16	13 (44.8%)	29
11	9	10 (52.6%)	19
12	17	13 (43.3%)	30
13	13	9 (40.9%)	22
14	3	11 (78.6%)	14
15	6	8 (57.1%)	14
Total	229	110 (32.4%)	339

1: age of the children, in years: 2: number of IFAT results considering positive serum with titer ≥ 16; 3: total number of children analyzed in each age group.

Table 2
Results of indirect immunofluorescent antibody test (IFAT) in serum samples of the children resident in the community Jardim São Remo grouped according to the monthly household income

Monthly income (US$)[1]	IFAT result[2]		Total[3]
	Negative (%)	Positive (%)	
Less than 60	12 (70.59)	5 (29.41)	17
From 60 to 180	90 (68.18)	42 (31.82)	132
From 180 to 300	64 (65.98)	33 (34.02)	97
From 300 to 480	33 (68.75)	15 (31.25)	48
Over to 480	15 (78.95)	4 (21.05)	19
Total	214 (68.37)	99 (31.63)	313

Pearson Chi-Square = 1.283; p value = 0.864, 1: monthly household income; 2: number of IFAT results considering positive serum with titer ≥ 16. The values in parenthesis are percentages of the total in each row; 3: total number of children analyzed in each age group. The monthly household income of 26 families is unknown.

Besides, seroconversion in São Remo population occurs earlier than in the children from São Paulo city.

Nevertheless, the seroprevalence of toxoplasmosis in children from Jardim São Remo is lower than those registered in other large urban centers[3,5,9,11], if considered the individuals belonging to the age ranges up to nine years.

The data indicates that seropositivity increases in accordance with the age of the children, suggesting that the infection is chiefly postnatal (Fig. 1). The age dependence of the prevalence of *T. gondii* infection in children from several localities from Brazil was already observed[1,5,6,9,11].

Confirmation of the classical risk factors for *T. gondii* infection in human is somewhat controversial in Brazil. Eating undercooked or raw meat and the presence of household cats were influential in transmitting *T. gondii*[11]. Nevertheless, other authors showed that such factors were not associated to differences in seroprevalence of anti-*T. gondii* antibodies[5].

Some authors have reported that lower socioeconomic status is associated to *T. gondii* infection and that drinking untreated and unfiltered water is the main risk factor to low income populations[1]. In the present work we did not assess risk factors. However, considering that the study population had access to municipally distributed treated water, if in one hand we inferred that consuming meat (specially the cheaper ones from sources other than those under regulation of sanitary authorities) can be considered a risk factor in this setting, on the other hand the association between *T. canis* and *T. gondii* seropositivity tempted us to infer that infection by oocysts via is also important in this population.

In fact, ingestion of oocysts from the environment and ingestion of tissue cyst by eating undercooked or raw meat are the two main modes of transmission of *T. gondii* to human. However, assessing the risk of such modes of transmission may be a difficult task in some particular situations. This is the case of the community Jardim São Remo, an economically-deprived area incrusted in the metropolitan area of São Paulo municipality.

Considering the extremely high population density in Jardim São Remo, if an individual report to have contact with cats, all his neighbors are probably at the same risk. It is noteworthy mentioning that the population density in Jardim São Remo is of one habitant at each 20 m^2. In addition, one should consider the inaccuracy of the determination of the number of cats given the fact that street cats are very common in this kind of community.

Neither eating habits nor the contact with cats were investigated as risk factors because of the reasons mentioned above. Otherwise, a significant correlation between seroprevalence for *T. gondii* and seroprevalence for *T. canis* was observed. In addition, *T. canis* seropositive children were 1.72 times more likely to be *T. gondii* positive than were *T. canis* seronegative children (Table 3). The human toxocariasis is a zoonosis which the only known mode of transmission is the ingestion of larved eggs (L2) shed by infected dogs. Such correlation suggests that the ingestion of oocysts may be an important mode of transmission of *T. gondii* in the infant population of Jardim São Remo.

Table 3
Association between *Toxoplasma gondii* and *Toxocara canis* infections in the children resident in the community Jardim São Remo

		T. canis infection		Total
		+	-	
T. gondii infection	+	42	68	110
	-	47	182	229
Total		89	250	339

Pearson Chi-Square = 11.967; p value = 0.001; Relative risk = 1.72 (CI 95%: 1.28 - 2.31).

RESUMO

Soroprevalência de toxoplasmose em comunidade de baixa renda da municipalidade de São Paulo, SP, Brasil

A toxoplasmose é uma das zoonoses mais comuns em todo o mundo. Estima-se que a soroprevalência desta enfermidade na população humana do Brasil esteja entre 40 e 80%. O objetivo deste estudo foi estimar a soroprevalência para a infecção pelo *T. gondii* em crianças entre um e 15 anos de idade em uma comunidade de baixa renda denominada comunidade Jardim São Remo, durante o ano de 2002. A comunidade estudada localiza-se na região Oeste do município de São Paulo, no estado de São Paulo, Brasil. Anticorpos contra *T. gondii* foram encontrados em 110 (32,4% IC 95%: 27.5 - 37.7) das 339 crianças submetidas ao teste de imunofluorescência indireta. A titulação das amostras revelou 29 amostras com título igual a 16, 14 crianças com título igual a 32, 18 crianças com título 64, 21 crianças com título 128, 20 crianças com título 256 e oito crianças com título maior ou igual a 512. A relação entre a idade das crianças e soroprevalência para toxoplasmose e a associação positiva entre soroprevalência para *T. gondii* e soroprevalência para *T. canis* sugere que a infecção ocorre principalmente após o nascimento. A soroconversão na população infantil da comunidade Jardim São Remo ocorre em crianças a partir de dois anos de idade, mais cedo, portanto que em crianças atendidas em centros de saúde da cidade de São Paulo. A soroprevalência para *T. gondii* em crianças de Jardim São Remo foi comparada com a soroprevalência em crianças de outros centros urbanos do Brasil.

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Received: 11 October 2005
Accepted: 14 March 2006