

A Serological Study on *Toxoplasma gondii* Infection Among People in South of Tehran, Iran

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Abstract: Although *Toxoplasma gondii* infection generally shows subclinical courses in adults, it may have severe pathologic effects on the fetus. For a survey of toxoplasmosis in Shahr-e-Rey area, south of Tehran, Iran, we conducted a serological study on 1,187 general populations using indirect fluorescent antibody (IFA) test. In this cross sectional study, cases were selected randomly by a local primary health care (PHC) system. Blood samples were collected in microcapillary tubes and sera were examined by IFA after centrifugation. It has been shown that 68.3% of cases in all age groups had IFA titer of 1 : 10 and higher, which we consider as positive cases, and the rate for 1 : 400 or over was 30.2%. There was meaningful correlation between anti-*Toxoplasma* antibody titers and age, sex, and occupation of subjected people ($P < 0.05\%$). The incidence was higher in females and highest in the children age group (10-14 years old). The present study demonstrates high prevalence of *Toxoplasma* infection among the people in south of Tehran, Iran.

Key words: *Toxoplasma gondii*, toxoplasmosis, seroepidemiology, shahr-e-Rey, tehran, Iran

Toxoplasma gondii infection has shown considerable prevalence in Iran [1]. There were studies on *Toxoplasma* infection in Iranian communities from many different points of view. Ghorbani et al. [2] reported in 1978 their first seroepidemiologic studies in a southwestern part of Iran. Later many other seroepidemiological studies were conducted by Agha-Miri in south of Iran [3]. Shemirani [4] determined the *Toxoplasma* infection rate in outpatients referred to a gynecology clinic in south of Tehran (4). Sharif et al. [5] studied this infection in mentally retarded handicaps, and Fallah et al. [6] determined the prevalence of infection in primigravida women in Hamadan, but there was little publication about general prevalence of *Toxoplasma* infection in Tehran. We conducted the present study to determine the prevalence of *Toxoplasma* infection in Shahr-e-Rey area, south of Tehran. There were several studies about *Toxoplasma* infection in Iranian communities, but no study in general population in Tehran, the capital of Iran, is seen.

The present cross sectional study was based on systematic cluster sampling in different social and demographic groups in Shahr-e-Rey area. By using local health center files, a total of 1,187 cases were selected randomly. These health centers were as follows: Badr Urban Health Center, Doulat-Abad Urban Health Center,

Nick-Nejad Urban Health Center, Ghuch-Hesar Rural Health Center, Bagher-Abad Rural Health Center, and Shur-Abad Rural Health Center. In these centers, health services are performed actively and these active services made it easy to find cases for our study. For each case general information and demographic data were saved before sampling. The data included age, sex, occupation, literacy, family dimension, keeping animal, water supply condition, and nutritional behaviors. Each of blood samples was collected in 3 hematocrit tubes and transferred in a cold box to the laboratory of Parasitology, Tehran University of Medical Sciences. After centrifugation, the serum samples were examined by an IFA technique, and the results were added to the general data sheet. Antigens were prepared from *T. gondii* RH strain in the above mentioned laboratory and whole anti-human antibody conjugate was used for fluorescence. Dilution of sera was determined as 1 : 10, 1 : 100, 1 : 200, 1 : 400, 1 : 800, 1 : 1,600, and 1 : 3,200. In this study, 1 : 10 titer was considered as positive [7].

The results showed that 68.4% of cases in different communities had serum titers of 1 : 10 or higher, and the rate was 30.2% for 1 : 400. The negative rate was 31.6%. Table 1 shows more details on these titers. Although there is a correlation between age and prevalence of infection in different age groups ($P = 0.001$), there was a descending curve in the age group of 40-50 years. Table 2 and Fig. 1 show this phenomenon; ascending curves showing high risk ages are seen at the age group of 10-14 and the age group of 30-39. Sex and *Toxoplasma* infection had also a

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Table 1. Frequency of anti-toxoplasma IFA antibody titers among people in Shahr-e-Rey area, south of Tehran, Iran

Titer	No.	Frequency (%)	Reverse cumulative frequency (%)
Negative	375	31.6	100.0
1 : 10	187	15.8	68.4
1 : 100	180	15.2	52.7
1 : 200	87	7.3	37.5
1 : 400	117	9.9	30.2
1 : 800	80	6.7	20.3
1 : 1,600	126	10.6	13.6
1 : 3,200	35	2.9	2.9
Total	1,187	100.0	

Table 2. Age distribution of anti-toxoplasma IFA positive cases among people in Shahr-e-Rey area, south of Tehran, Iran

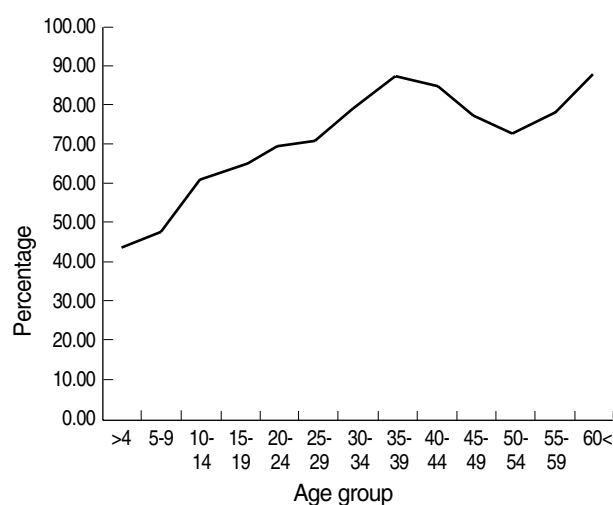
Age	Positive ^a			Negative		Total
	No.	%	Commulative % to total positive cases	No.	%	
>4	36	43.9	4.4	46	56.1	82
5-9	67	47.5	12.7	74	52.5	141
10-14	64	61.0	20.6	41	39.1	105
15-19	70	64.2	29.2	39	35.8	109
20-24	127	69.8	44.8	55	30.2	182
25-29	116	70.7	59.1	48	29.3	164
30-34	116	80.6	73.4	28	19.4	144
35-39	73	86.9	82.4	11	13.1	84
40-44	50	84.8	88.6	9	15.3	59
45-49	23	76.7	91.4	7	23.3	30
50-54	21	72.4	94.0	8	27.6	29
55-59	14	77.8	95.7	4	22.2	18
60<	35	87.5	100.0	5	12.5	40
Total	812			375		1,187

^ahigher than 1 : 10 in IFA titer.

correlation; the infection was significantly higher in women ($P = 0.00$) than men. Table 3 shows higher prevalences in females; according to our findings 80.2% of positive cases were females and less than 20% were males, whereas in negative cases the distribution was not highly different (56.5% in females and 43.5 in males). Occupation and *Toxoplasma* infection showed significant correlations ($P = 0.008$), and social reasons forced us to classify the occupations into 3 groups, i.e., mental activities (teachers and students), manual activities (workers, farmers, and housewives), and other occupations (unemployed and others). Many other variables were checked in this study. These included history of keeping dogs, cats, chickens, domestic birds, pigeons, history of lymphadenitis, ocular disorders and abortion, nutritional behaviors (routine consumption of raw vegetables and junk

Table 3. Distribution of *Toxoplasma* seroprevalence by IFA test according to sex

Sex	Seronegative		Seropositive		Total No.
	No.	%	No.	%	
Female	212	24.6%	651	75.4%	863
Male	163	50.3%	161	49.7%	324
Total	375		812		1,187

**Fig. 1.** Distribution of different titers of anti-toxoplasma IFA antibody according to age group in Shahr-e-Rey area, south of Tehran, Iran.

food), residential status (living in a house or an apartment). However, there was no significant correlation between *Toxoplasma* infection and these parameters.

Comparing with other researches in which the titer 1 : 20 was considered as the positive cut-off point, our study showed a 68.4% prevalence in general population in south of Tehran. This finding is well correlated with Shemirani [4] who found 55% prevalence of *Toxoplasma* infection in women referred to labor section of 2 gynecology clinics in south of Tehran. Assmar et al. [1] reported 51.8% prevalence in general population of Iran [1]. Ghorbani et al. [2] showed 55.7% prevalence in a rural area in northern Iran. Studies have shown increases in the prevalence of *Toxoplasma* infection in Iran. In Khuzestan province, South-west Iran, Ghorbani et al. [8] reported 17.7% prevalence in 1977, and Agha-Miri [3] reported 44.5% prevalence in 1993. According to Agha-Miri [3], the prevalence of *Toxoplasma* infection in south of Iran, from southwest to mid-south was between 42.7% and 44.5%. On the other hand, *Toxoplasma* infection was more prevalent among immigrants [9]. Most people in Shahr-e-Rey area are immigrants, and thus *Toxoplasma* infection was high; this corresponded well with findings in Malaysia

[9]. Hershey and McGregor [10] showed that *Toxoplasma* infection was more prevalent in low altitude areas. This is also corresponded well with the low altitude of Shahr-e-Rey comparing with other parts of Tehran. Although Jackson et al. [13] did not find significant correlations between infection and sex, there were biological [12] and epidemiological evidences generally showing a high prevalence in the male gender [13]. According to Ghorbani et al. [2,8], there were significant correlations between *Toxoplasma* infection and sex in Azerbaijan province and age in Gilan province, which were compatible with the results of the present study. The present study included most women in pregnancy ages, and they were considered already infected. Since the infection occurs in early years of life, more attention should be paid in this protozoan infection.

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