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Original Article

Seroprevalence of *Toxoplasma gondii* Infections in Pregnant Women in Gorgan City, Golestan Province, Northern Iran-2012

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Abstract

Background: *Toxoplasma gondii* is one of the most prevalent parasites of human and warm- blooded animals. Toxoplasmosis is important especially in two groups: pregnant women and immunocompromised patients. If women acquire the primary infection during the pregnancy, it would be life threatening or remains severe disorders for the fetus. This study was performed to evaluate the seroprevalence of *T. gondii* infection in pregnant women referred to Health Center in Gorgan City, Golestan Province, northern Iran.

***Methods*:** Serum samples were collected from pregnant women referred to Health Center in Gorgan City, south eastern Caspian Sea. Anti- *Toxoplasma* IgG and IgM antibodies were determined by commercially ELISA kits and the relation of infection with socio-demographic and risk factors such as age, education, occupation, cat ownership, soil contact and some other factors was studied.

***Results*:** From 555 tested sera of pregnant women referred to Health Center in Gorgan, 39.8% had IgG antibodies against *T. gondii* and 3.4% were positive for IgM antibodies. A significant correlation was seen between *T. gondii* infection with age and soil contact.

***Conclusion*:** About 60% of pregnant women in Gorgan City are seronegative against *T. gondii*, so they should considered as at risk persons.

Introduction

Toxoplasma gondii, the obligate intracellular parasite, can invade the host cells and lysis them (1, 2). In congenital infections, encephalitis or systemic diseases would be occurred. If so, toxoplasmosis may result in loss of fetus or lesions in brain and eyes (3). Estimation of at risk population and risk factors are essential for preventive measures and strategies.

Diagnosis is routinely based on serological methods with detection of specific antibodies to *T. gondii* (2, 4). Different serological examinations such as latex- agglutination (LA), enzyme-linked immunosorbent assay (ELISA), indirect fluorescent assay (IFA), and haemagglutination tests have been used in the detection of antibodies against *T. gondii* (4, 5). Dubey and Beattie (6) Summarized *T. gondii* prevalence rates before 1988 and Tenter et al. (7) did for studies 1989-2000. According to these surveys the prevalence of *T. gondii* in human ranged from 4% in Korea (8) to 92% in Brazil (9). A recent systematic review study of toxoplasmosis in Iran reported prevalence ranging from 18 to about 70% with the highest rate in humid mild northern regions (10).

Gorgan City is the center of Golestan Province in north-east of Iran. Because of appropriate climate for oocysts sporulation in this area, it is expected to have high prevalence of infection there. Due to prevention strategies in congenital toxoplasmosis, estimation of infection is necessary. This study was performed to determine the prevalence of *T. gondii* antibodies in pregnant women in Gorgan City, Golestan Province.

Material & Methods

This cross sectional study was performed from September to October 2012 in Gorgan City, South east of Caspian Sea, northern Iran, which has a population about 300, 000 people. The city has a moderate and humid climate. In the current survey, sample size was calculated considering a prevalence of 35%, a degree of precision of 4 (d=0.04) and 95% confidence interval. Consequently, the sample size was calculated as 546 pregnant women.

Collecting samples

The objects were women referred to Health Center in Gorgan for routine examinations of pregnancy. A questionnaire containing socio-demographic and behavioral habits was designed and completed for individuals. Overall, 555 blood samples were collected and sera separated by blood centrifugation at 3000 rpm for 5 min. Serum samples were transferred to the Department of Parasitology, School of Medicine, Golestan University of Medical Sciences and stored at -20 °C until use.

Analyzing samples

The anti- *T. gondii* IgG and IgM antibodies were tested with commercial ELISA kit (Pishtaz Teb Zaman, Tehran, Iran) according to manufacturer instructions and results read by an automated ELISA reader machine (Stat Fax® 2600, USA). All samples were conducted as a single test. Standards with three different concentrations were employed to ensure kits were working properly and technical procedures were performed correctly.

Statistical analysis

ELISA results and data from questionnaires were analyzed employing Chi-square statistical test with 95% confidence interval using SPSS software version 16. The correlation between *T. gondii* infection with some variables such as age, living place (urban/rural), education, occupation, cat or other animals ownership, soil contact, consumption of raw/undercooked meat or egg, consumption of raw/unpasteurized milk, vegetables washing method, frequency of consuming vegetables was estimated.

Results

The overall seroprevalence of *T. gondii* infections among pregnant women referred to Health Center in Gorgan was 41.8% (232/555). The IgG and IgM antibodies against *Toxoplasma gondii* were positive in 221/555 cases (39.8%) and 19/555 cases (3.4%), respectively. Eight pregnant women (1.4%) indicated both IgG and IgM antibodies against *T. gondii*. The results of seroprevalence along with personal and socio-demographic data are indicated in Table 1.

The correlation between age (P= 0.042) and soil contact (P= 0.002) with the *T. gondii* infection was statistically significant. No significant relationship was seen between toxoplasmosis and other tested variables. The data of mentioned criteria are detailed in Table 2.

Table 1: Prevalence of specific anti- *Toxoplasma* IgG and IgM antibodies and socio demographic data in pregnant women in Gorgan, Iran, 2012

Socio- demographic characteristics		No. of tested women	Prevalence of *T. gondi* IgG			Prevalence of *T. gondi* IgM		
			No.	(%)	95% CI	No.	(%)	95% CI
Age group (yr)	≤20	92	25	27.2	17.91- 36.44	8	8.7	2.83- 14.56
	21-30	349	135	38.7	33.55- 43.82	9	2.6	0.91- 4.25
	>30	114	61	53.5	44.21- 62.80	2	1.8	0.69- 4.20
	total	555	221	39.8	35.73- 43.91	19	3.4	1.91- 4.94
Location	urban	290	104	35.9	30.31- 41-41	7	2.4	0.64- 4.19
	rural	265	117	44.15	38.13- 50.17	12	4.53	2.01- 7.05
Education	none	41	18	43.9	28.04- 59.76	1	2.4	2.28- 7.37
	elementary school	116	60	51.7	42.49- 60.95	5	4.3	0.56- 8.06
	guidance School	122	51	41.8	32.93- 50.68	5	4.1	0.53- 7.67
	high school	201	70	34.8	28.18- 41.47	5	2.5	0.32- 4.66
	university	75	22	29.3	18.79- 39.88	3	4	0.54- 8.43
Occupation	employed	31	9	29	12.11- 45.96	2	6.5	2.2- 15.61
	unemployed	524	212	40.5	36.24- 44.67	17	3.24	1.72- 4.77
Gestational	first trimester	205	84	40.1	34.19- 47.76	13	6.34	2.98- 9.71
age	second trimester	166	72	43.4	35.76- 50.99	4	2.4	0.5- 4.77
	third trimester	184	65	35.3	28.35- 42.30	2	1.1	0.43- 2.60

Discussion

This study revealed a seroprevalence of 39.8% (221/555) and 3.4% (19/555) for IgG and IgM antibodies against *T. gondii* in pregnant women in Gorgan City, respectively. Congenital toxoplasmosis can lead to a wide variety of manifestations from spontaneous abortion and still-birth to hydrocephalus or microcephalus, cerebral calcifications and retinochorioditis in the fetus and infant (11, 12). Studies had been performed to evaluate the *T. gondii* infection in pregnant women or child bearing age in some countries and different seroprevalences were estimated. The reported seroprevalences of *T. gondii* infection were 51.4% in Saudi Arabia (13), 59% in Argentina (14), 43% in Austria (15), 30% in Spain (16), 22.1% in Slovakia (17), 24.6% in Turkey (18) and 92.5% in Ghana (19). The prevalence rate of 29.1% and 0.8% for anti- IgG and IgM antibodies in pregnant women was estimated in Zair, Nigeria (20).

Table 2: Risk factors relevant to *T. gondii* infection among pregnant women in Gorgan, Iran

Variables		Odds ratio	95% Confidence interval	*P* value
Age group (yr)	≤20	1	-	-
	21-30	1.691	1.018-2.808	0.042
	>30	3.085	1.712-5.557	<0.001
Occupation	Employed	1	-	-
	Unemployed	0.602	0.272-1.333	0.602
Location	Rural	1	-	-
	Urban	0.707	0.503-0.995	0.047
Education*	Non	1	-	-
	Elementary school	1.421	0687-2.941	0.343
	Guidance school	1.063	0.513-2.20	0.870
	High school	0.777	0.388-1.554	0.475
	University	0.524	0.235-1.169	0.115
Gestational age	First trimester	1	-	-
	Second trimester	1.103	0.729-1.670	0.642
	Third trimester	0.787	0.522-1.187	0.253
Cat ownership*		1.994	0.206-19.292	0.551
Soil contact¥	Yes	1	1.350-3.562	0.002
	No	2.283	-	-
Other animal ownership ¤		1.023	0.608-1.722	0.932
Raw/undercooked meat¤		1.625	0.810-3.259	0.171
Raw/undercooked Egg¤		1.004	0.702-1.463	0.982
Raw/unpasteurized milk ¤		1.116	0.773-1.612	0.164
Method of washing vegetables	Water	1	-	-
	Salt	0.505	0.175-1.456	0.206
	Dish washing liquid	0.636	0.213-1.899	0.636
	Disinfectant	0.582	0.205-1.651	0.309
Frequency of consuming vegetables	Rarely	1	-	-
	Every day	1.203	0.656-2.209	0.550
	Every week	1.145	0.679-1.932	0.612
	Every month	1.60	0.793-3.228	0.189

*Adjusted by age ¥Adjusted by age and location ¤ Adjusted by age, education and location

Among pregnant women tested in rural Durango State, Mexico, IgG antibodies against *T. gondii* infection varied from 0% to 20% in different communities. Overall, 8.2% had IgG and 2.3% had IgM antibodies, too (21).

In Iran, the prevalence rates of 22.7% and 31% were estimated in pregnant women form Kermanshah (22) and Khorram-Abad (23), whereas the rate of *T. gondii* infection was 20.1% and 19.2% in pregnant women of Isfahan (24) and Sabzavar (25), respectively. Abdi et al. found the prevalence rate of 44.8% of infection in Ilam Province (26). A study in Kerman, South eastern Iran, reported a prevalence of 46.9% in pregnant women (27). In Zanjan City, located in northwest of Iran, 1.4% and 37.2% of tested pregnant women had IgG and IgM antibodies against *T. gondii*, respectively (28).

North of Iran has suitable climate for oocyst sporulation of *T. gondii*, so high prevalence of infection is expected there. The present study showed a high rate of IgG anti-*T. gondii* antibody (39.8%) positive along with a relatively low prevalence rate for IgM (3.4%) in pregnant women in Gorgan City. According to a previous study in the Caspian Sea area *T. gondii* infection was common in north of Iran with prevalence rate of 55.7% for IgG antibody (29). Another study indicated 71% seropositivity of IgG anti *Toxoplasma* in pregnant women in Sari city of Mazandaran province, northern Iran (30). There is not previous study of toxoplasmosis in pregnant women in Golestan Province; however Saeedi et al. performed a survey on women who referred to Gorgan Marriage Consultation Center and reported 48.3% and 11.7% prevalence for IgG and IgM anti-*Toxoplasma* antibodies, respectively (31). Their prevalence rates for both antibodies were higher than current study. Moreover, the authors found a significant relationship between acute toxoplasmosis and keeping cat at home that is not obtained in our result, but is in concordance with some other studies in Bandar Abbas and Kerman cities in south of Iran (32, 33).

However, in the present study the relation of the *Toxoplasma* infection with age was statistically significant that is in concordance with results of some previous studies in other parts of Iran such as Bandar Abbas (32), Hamadan (34), Khorram-Aabad (23) and Alashtar (35). Also, our results indicated a significant difference between *T. gondii* infection and soil contact that is not surprising since north of Iran has appropriate climate for oocyst sporulation and contacting with oocyst infected soil is one of the common routes of human infection. In the current study there was no statistically significant relationship between toxoplasmosis and some tested criteria such as living place (urban/rural), education, occupation, cat or other animals ownership, or egg, consumption of raw/unpasteurized milk, vegetables washing method, frequency of consuming vegetables. Whereas significant correlation was reported between the infection with education (23, 36, 37), consumption of raw/undercooked meat (33, 34) and frequency of consuming vegetables (34, 36) in some previous studies in Iran.

Conclusion

The results of this study indicate that about 60% of pregnant women in this city had no contact with the parasite and are at risk for congenital toxoplasmosis, so, preventive measures and establishing diagnostic toxoplasmosis tests during pregnancy are warranted.

Acknowledgments

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