
Seroprevalence Of Anti *Toxoplasma gondii* IgG and IgM Among Pregnant Women in Sana'a Capital and Capital Trusteeship

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Abstract:

From 463 pregnant women serum samples were collected through 2007 and 2008 for detection of specific anti-*Toxoplasma gondii* antibodies at Sana'a capital and capital trusteeship. The serological test used for diagnosis is the enzyme linked immunosorbent assay (ELISA) method for anti *Toxoplasma gondii* IgG and IgM detection.

When ELISA was applied on serum samples obtained from pregnant women were seen in, 194 samples (41.90 %) were seropositive for anti *T. gondii* IgG and 55 (11.88 %) for anti *T. gondii* IgM (Table 1). The highest percentage of IgG seropositivity obtained in the age groups of (> 40 years) where 2 (50.0%) of the samples examined were +ve for anti *T. gondii* IgG, followed by age group (31-40 years), 24 (45.3%), then age group (21-30 years), 110 (42.1%) and finally age group (\leq 20 year), 58 (40.0%) (Table 2). On The other hand, IgM antibodies were highest percentage obtained in the age groups of (31-40 years) where 10 (18.9%) of the samples examined were +ve for anti *T. gondii* IgM, followed by age group (21-30 years), 29 (11.1 %) and age group (\leq 20 year), 16 (11.0%) (Table 3).

The present study confirmed the presence of Toxoplasmosis pregnant women at Sana'a capital and capital trusteeship and the risk represented by this protozoan infection. It may be appropriate to screen women before and during pregnancy, any raise in seropositivity should be dealt with in order to minimise the consequences of this infection.

Key Words:

Toxoplasma gondii, Toxoplasma IgG and IgM, Pregnant women, ELISA, and Sana'a Yemen.

Introduction:

Toxoplasmosis is an important disease which is caused by the coccidian parasite *Toxoplasma gondii*. It was reported first in human by Janku in 1923, who described the parasitic cysts in the retina of a child with congenital hydrocephalus. Its infection induces several immunological changes in the body which are characterized by the production of the immunoglobulins IgM, IgG and IgA (Wilson, 1990 and Dubey, 1994). The cats are the final host to *Toxoplasma gondii* and it is considered to be the major source of

human infection (Frenkel, & Ruiz, 1980). Cats can shed millions of oocysts after ingesting only a single bradyzoite, while ingestion of 100 bradyzoites may not infect mice orally (Dubey, 2001 and Dubey, 2006). Two major routes of transmission, oral through oocysts or tissue cysts ingestion and congenital by transplacental spread of tachyzoites. Toxoplasmosis is probably one of the most common human infections, the prevalence of human toxoplasmosis ranged from 1% to 90% in different countries (Daffos, *et al.*, 1988 and Remington, *et al.*, 1995).

The risk factors that are often associated with acute infection in pregnant women were eating raw or undercooked lamb, beef or game and contact with soil, while Weaker associations were observed for tasting raw meat during preparation of meals, drinking unpasteurised milk and animal contact (Remington *et al.*, 2001; Montoya & Liesenfeld, 2004). The main form of transmission is from an infected mother to the fetus through the placenta, the rate of placental transmission is between 17-25% when there is maternal infection during the first and second trimester and 65 % when infection occurs during the third trimester from pregnant women (Frenkel, 1990b and Dubey & Carpenter, 1993).

Toxoplasmosis can be diagnosed serologically in pregnant women by several testes that depend on the demonstration of anti-Toxoplasma antibodies in the serum (Frenkel, 1986; 1990a, b). During the acute course of infection, Toxoplasma antigen in the serum and other body fluids of the patients can be detected ELISA, is widely used for serodiagnosis of toxoplasmosis especially for detecting late antibody response to Toxoplasma (Turunen, 1983 and Remington & Desmonts, 1990). The assay uses an enzyme-conjugated antibody directed against total immunoglobulins (Carrier, *et al.*, 1980 and Konishi, 1989), IgG (Ahlfors, *et al.* 1989 and Suzuki, *et al.*, 1990) and IgM (Konishi, 1989). The present study investigated the seroprevalence of two antibodies (anti T. gondii IgG and IgM) from pregnant women sera by the enzyme-linked immunosorbent assay (ELISA) at Sana'a capital, in the capital Sana'a trusteeship as part of republic of Yemen, to evaluate the prevalence rate of T. gondii among pregnant women and emphasize its consequences.

Materials and Methods :

Blood (5 ml) was collected from 463 selected pregnant women between 2007 and 2008. The selection was based on visits of the patients to local capital Sana'a and on the subsequent referring by the specialist-physician for serological examination. To perform the serological tests at the central health laboratories in the capital Sana'a, collected samples were classified

into the following age groups: ≤ 20 , 21-30, 31-40 and > 40 years. The blood samples collected into a tube without anticoagulant and refrigerated overnight at 4oC. It was then centrifuged, serum harvested into eppendorf tubes, and stored at -20°C until tested. Samples were tested for anti-Toxoplasma IgG and IgM antipodies by using enzyme-linked immunosorbent assay (ELISA) test kit (Diamedix, Miami, Florida, United States of America), performed tests according to manufacturer's instruction, both IgG and IgM kits were used to detect anti-T. gondii immunoglobulins in serum samples. Collected data were entered in SPSS version 15.0 (statistic software package) and cross tabulated for descriptive and analytical statistics. The discrete variables were expressed as percentages.

Results:

The mean age of the pregnant women was 24.32 ± 5.69 years. All 463 samples were from Sana'a capital and capital trusteeship, 194 samples (41.90 %), were seropositive for anti T. gondii IgG and 55 (11.88%) were seropositive for anti T. gondii IgM as determined by the ELISA test (Table 1).

Table (1)
Seroprevalence of anti *T. gondii* IgG and IgM antibodies
(ELISA Test) in pregnant women

Antibody types	No. Tested	Positive		Negative	
		No.	(%)	No.	(%)
IgG	463	194	(41.90)	269	(58.09)
IgM	463	55	(11.88)	408	(88.12)

The distribution of positive serum samples among the different age groups for anti T. gondii IgG showed that pregnant woman of the age group > 40 years had the highest percentage (50.0 %) of positive results followed by the age group 31-40 year (45.3 %), and then by the age group 21-30 (42.1%), while age group ≤ 20 years showed the lowest percentage (40.0 %), (Table 2).

Table (2):
Frequency of anti *T. gondii* IgG antibodies (ELISA Test) among different age groups of pregnant women

Age range (years)	No. Tested	IgG	
		N. positive (%)	N. negative (%)
≤ 20	145	58 (40.0)	87 (60.0)
21-30	261	110 (42.1)	151 (57.9)
31-40	53	24 (45.3)	29 (54.7)
> 40	4	2 (50.0)	2 (50.0)

While distribution of positive serum samples among the different age groups for anti *T. gondii* IgM showed that pregnant women of the age group 31-40 year had the highest percentage (18.9%) of positive results, followed by the age group 21-30 year (11.1 %), and then by the age group ≤ 20 (11.0%), (Table 3).

Table (3)
Frequency of anti *T. gondii* IgM antibodies (ELISA Test) among different age groups of pregnant women

Age range (years)	No. Tested	IgM	
		N. positive (%)	N. negative (%)
≤ 20	145	16 (11.0)	129 (89.0)
21-30	261	29 (11.1)	232 (88.9)
31-40	53	10 (18.9)	43 (81.1)
> 40	4	0 (00.0)	4 (100)

Discussion:

In this study overall seropositivity to *T. gondii* among pregnant women for anti-IgG seroprevalence (Chronic phase) was (41.90%) which means that about 59% of pregnant women are at risk of acquiring the infection if they are exposed during pregnancy, and consequently could transmit the infection to the fetus. As well as anti-IgM seroprevalence (Acute phase) was

11.88% this reflects the risk among pregnant women with a recent infection who might transfer the parasite to the fetus. The anti-IgG and anti-IgM seroprevalence of *Toxoplasma* increased with age: older women are more susceptible to the parasite than younger women as a result of longer exposure time. Our findings are higher than that reported by Nijem and Al-Amleh, 2009 among pregnant women in Hebron district (Palestine) was (27.9%) for anti-IgG and (17.6%) for anti-IgM. It is also higher than that reported by Al-Harhi, *et al.*, 2006 among pregnant women in Makkah (Saudi Arabia) was (29.4%) for anti-*Toxoplasma* IgG, (5.6%) for anti-*Toxoplasma* IgM. The rate is also higher than that reported by Ghazi, *et al.*, 2002 among Saudi women was (35.6%) and Baghdad (22.8 %) (Najm *et al.*, 1968). And the highest from that reported by Allain *et al.*, 1998 (10 %) in United Kingdom and Norway (Jenum *et al.*, 1998).

This risk was associated with the pregnant women at Sana'a capital and capital trusteeship. Conversely showed the highest positive reactions for *Toxoplasma* antibodies, in another countries/region in women or general people or another animals as reported by Ancelle *et al.*, 1996 (55%) in France and Greece (52.3%) (Decavalas *et al.*, 1990), higher prevalence rates were also reported in some Arab countries like Kuwait (58.2%) (Al-Nakib *et al.*, 1983). The toxoplasmosis occurs worldwide, seropositivity for anti-IgG levels vary widely among different regions of the globe ranging from a low of (4.1 % for anti T-IgG and 4.3 for anti T-IgM) in Thailand (Pinlaor, *et al.*, 2000) to (75%) in Brazil (Coelho, *et al.*, 2003). The reasons for the variation in the prevalence of *Toxoplasma* antibodies in pregnant women at Sana'a capital and capital trusteeship are not known. However it is reasonable to assume that animals their living in the first floor from Yemeni homes, to contact with cats, as well as much women working in breeding animals and milking it in their homes, drinking unpasteurised milk also to socioeconomic and life-style differences play major roles in acquiring the disease and hence different serological patterns appear (Standford, *et al.*, 1990; Frenkel, 1990a and Lopez, 2000). It is also known that various serological test may produce different results because of the inherent sensitivity differences between the serological tests (Remington & Desmots, 1990; Wilson *et al.*, 1990 and Dubey, 1994). Based on these facts it is important to conduct further serological examinations periodically in different parts of the country in order to understand the pattern of seroprevalence of *Toxoplasma* antibodies and hence the incidence of Toxoplasmosis among pregnant women.

The age group that gave the highest percentage of positive reaction was in age group > 40 year (50.0% for anti T. gondii IgG), latest age group ≤ 20 (40.0% for anti T. gondii IgG and 11.0% for anti T. gondii IgM) (Table 2 and Table 3). These results confirms the fact that seroprevalence of Toxoplasma is well known to increase with age, the greater the prevalence, the earlier the rise (Remington et al., 2001 and Dupouy-Camet et al., 1993), This relation that showed in this study does not mean that older age is a risk factor predisposing to infection but might be explained by the older the person the longer time being exposed to the causing agent and may retain a steady level of Toxoplasma in serum for years. This is similar to find in women pregnant in Makkah (Al-Harathi, et al., 2006 and Sundar, et al., 2007).

Conclusion:

Our study showed a high seroprevalence of T. gondii antibodies among pregnant women in Sana'a capital and capital trusteeship. Hence we recommend the implementation of health extension programmes among pregnant women in order to prevent primary infection during pregnancy. Screening of women for Toxoplasma antibodies before and during pregnancy and periodic surveillance of the disease among population all over the country is also recommended.

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الانتشار المصلي لمضادات داء المقوسات (داء القطط) نوع "ج" و "م" بين النساء الحوامل في العاصمة صنعاء وأمانة العاصمة

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الملخص:

هدفت الدراسة إلى تقييم نسبة انتشار داء المقوسات (داء القطط) بين النساء الحوامل في العاصمة صنعاء وأمانة العاصمة وذلك من خلال قياس مستوى الأضداد المناعية المتخصصة للمرض في أمصال النساء المصابات ومدى انتشار المرض بين الفئات العمرية المختلفة وتحديد الفئات العمرية الأكثر عرضة للمرض. تم جمع ٤٦٣ عينة مصل من النساء الحوامل خلال عامي ٢٠٠٧ و ٢٠٠٨. الاختبار المصلي المستخدم لغرض التشخيص كان الفحص المناعي بالأنزيم المرتبط (إليزا) للكشف عن الجلوبيولين المناعية نوع "ج" و "م" للطفيلي.

عند تطبيق الفحوصات على عينات الدم التي تم الحصول عليها من النساء الحوامل أظهرت النتائج ان النسبة المئوية للأجسام المضادة من النوع "ج" والتي تدل على نسبة الإصابة المزمنة بطفيلي التوكسوبلازما كانت (٤١,٩٠٪) بينما النسبة المئوية للأجسام المضادة من النوع "م" والتي تدل على نسبة الإصابة الحادة للمرض كانت (١١,٨٨٪) من بين العينات المدروسة (جدول ١). وكانت أعلى نسبة للإصابة بدلالة الجلوبيولين المناعي "ج" بين النساء الحوامل في الفئة العمرية (< ٤٠ سنة) والتي وجدت في عينتين من اصل ٤ عينات بنسبة (٥٠,٠٪) من العينات المدروسة، تلتها الفئة العمرية (٣١ - ٤٠ سنة) والتي كانت بعدد ٢٤ عينة بنسبة (٤٥,٣٪)، ثم الفئة العمرية (٢١ - ٣٠ سنة) حيث وجد أن ١١٠ عينة كانت موجبة بنسبة (٤٢,١٪) وأخيراً المجموعة العمرية (≥ ٢٠ عاما) والتي كانت ٥٨ عينة موجبة للجلوبيولين المناعي "ج" بنسبة (٤٠,٠٪) والجدول (٢) يبين ذلك. ومن ناحية أخرى كانت أعلى نسبة للإصابة بالمرض بدلالة الجلوبيولين المناعي "م" في الفئات العمرية من (٣١ - ٤٠ سنة) حيث وجد أن ١٠ عينات كانت موجبة بنسبة (١٨,٩٪) من العينات المدروسة، تلتها الفئة العمرية (٢١ - ٣٠ سنة) والتي كانت ٢٩ عينة موجبة للضاد "م" بنسبة (١١,١٪) وأخيراً الفئة العمرية

(≥ ٢٠ عاماً) والتي كانت ١٦ عينة بنسبة (١١,٠٪) من بين ١٤٥ امرأة من عينة الدراسة (جدول ٣).

أكدت الدراسة وجود نسبة كبيرة من النساء الحوامل مصابات بداء المقوسات في العاصمة صنعاء وأمانة العاصمة، وهذه النسبة تشكل خطراً للإصابة بالطفيلي بين النساء الحوامل. ولتجنب أي زيادة في الإصابة بهذا الطفيلي يجب عمل فحوصات دورية للنساء الحوامل قبل وأثناء فترة الحمل للتقليل من آثار الإصابة.