

Seroprevalence of Immunoglobulin G (IgG) and Immunoglobulin M (IgM) and Risk Factors of Toxoplasmosis for A sample of Pregnant Women in Baghdad

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ABSTRACT

Background: Toxoplasmosis is a very common infection caused by the obligate intracellular protozoan parasite. This parasite is called *Toxoplasma gondii* widely distributed around the world. *Toxoplasma gondii* can be vertically transmitted to the fetus during pregnancy and may cause wide range of clinical manifestations in the offspring.

Objective: To determine seroprevalence Immunoglobulin G (IgG) and Immunoglobulin M (IgM) to toxoplasma gondii among pregnant women and to identify the risk factors.

Type of the study: A cross-sectional study.

Methods: A total of 110 blood samples of pregnant women were collected from private laboratory for Dr. Luay Ibrahim to Pathogenesis Analyses in Baghdad Al-Mansour- 14 Ramadan street. Which obtained during the period from 1st March 2016 till the 30th June 2016. Data was collected by using direct interviewing questionnaire sheet concerning their ages of pregnant women between (less than 20 to more than 40 years old), place of residence (urban, rural), level of education (illiteracy, literacy), number of previous abortion (one, two, three or more), contact with (cat and other domestic animal or no animal in house). The diagnosis is based on IgG and IgM antibodies of *Toxoplasma gondii* were measured using a commercial Kit (Cobas Toxo IgG, Toxo IgM) according to the Roche Diagnostic manufacturer's instructions. Each blood was analyzed for the presence of *Toxoplasma gondii* by identifying serum

IgG and IgM antibodies using Enzyme-linked Immunosorbent Assay (ELISA).

Results: A total of 110 pregnant women were enrolled and screened for the presence of anti-toxoplasma IgG and IgM antibodies. The seroprevalence of *Toxoplasma gondii* IgG and IgM antibodies result revealed that 40 (36.4%) of 110 pregnant women were positive for anti-toxoplasma-antibody IgG and 70 (63.6%) of 110 were negative for anti-toxoplasma-antibody-IgG while revealed that 16 (14.5%) of 110 pregnant women were positive for anti-toxoplasma-antibody IgM and 94 (85.5%) of 110 were negative for anti-toxoplasma-antibody IgM.

Conclusions: the present study shows that anti-*Toxoplasma* IgG Ab are higher than anti-*Toxoplasma* IgM Ab in pregnant women between the age group 20 to 30 years in literacy educational level and rural area also recorded the highest rates of seropositivity among women with only one previously abortion in contact with cats are more affected.

Key Word: Pregnant women, *Toxoplasma gondii*, IgG anti-*Toxoplasma*, IgM anti-*Toxoplasma* Ab.

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Toxoplasmosis is a very common infection caused by the obligate intracellular protozoan parasite⁽¹⁾. This parasite is called *Toxoplasma gondii* widely distributed around the world⁽²⁾. It is a facultative heterogeneous parasite whose definitive hosts are members of the family Felidae including domestic cat but is capable of infecting mammals, birds and reptiles as intermediate hosts⁽³⁾. The high prevalence of toxoplasmosis has a relationship with its mode of transmission, as it can spread very easily⁽⁴⁾. Two main routes of transmission have been described in humans- by oral ingestion of the parasite and through placental transmission to the fetus, The organism is horizontally transmitted to humans by accidental ingestion of water, food or soil contaminated with *Toxoplasma gondii* Oocyst or consumption of meat containing *Toxoplasma gondii* cysts that is eaten raw or undercooked meat from

infected animal. *Toxoplasma gondii* can be vertically transmitted to the fetus during pregnancy and may cause wide range of clinical manifestations in the offspring depending on the gestational age at which the primary maternal infection was acquired, the virulence of the parasite and the immunologic development of the fetus^(5,6). The women may have spontaneous abortions, stillbirths, or premature delivery in addition to various fetal anomalies⁽⁷⁾. The frequency of severe congenital infections can be limited by early screening for specific antibodies to *Toxoplasma gondii* in the serum of pregnant women⁽⁸⁾. Typically the organisms causes only a symptomatic or mild infection in pregnant women but it can cause much more serious clinical complications to the fetus, identification of these susceptible women is essential so that early treatment can be offered to minimize the congenital transmission⁽⁹⁾. Toxoplasmosis during

pregnancy can cause congenital infection and manifest as mental retardation and blindness in the infant, the severity of fetal disease varies inversely with gestational age at which maternal infection occurs⁽¹⁰⁾. Epidemiology studies indicate that prevalence of *Toxoplasma gondii* infection in pregnant women varies substantially among countries⁽¹¹⁾. Seroprevalence estimated for human population varies greatly among different countries, different geographical areas within one country and among different ethnic groups living in the same area⁽¹²⁾. Infection may occur in any organ, patient may have headache and disorientation drowsiness, hemiparesis, reflex changes and convulsions, encephalitis caused by *Toxoplasma gondii* is now recognized with great frequency in patients treated with immunosuppressive agents⁽¹³⁾. Treated by their own healthcare providers with spiramycin or pyrimetamine / sulfadiazine /folinic acid depending on their gestational age⁽¹⁴⁾.

Methods:

Patients: A total of 110 blood samples of pregnant women were collected from private laboratory for Dr. luay Ibrahim to Pathogenesis Analyses in Baghdad Al-Mansour- 14 Ramadan street. Which obtained during the period from 1st March 2016 till the 30th June 2016. Data was collected by using direct interviewing questionnaire sheet concerning their ages of pregnant women between (less than 20 to more than 40 years old), place of residence (urban, rural), level of education (illiteracy, literacy), number of previous abortion (one, two, three or more), contact with (cat and other domestic animal or no animal in house).

Blood sample withdrawn from each woman by Professional clinical laboratory technique. Venous blood samples 5 ml was collected after disinfected of skin by 70 % alcohol and then blood was poured in plain container and centrifugation at 3000 rpm for 5 minutes to obtain the serum. The serum was stored at - 20 ° C until analysis. Each blood was analyzed for the presence of *Toxoplasma gondii* by identifying serum IgG and IgM antibodies using Enzyme-linked Immunosorbent Assay (ELISA). The diagnosis is based on IgG and IgM antibodies of *Toxoplasma gondii* were measured using a commercial Kit (Cobas Toxo IgG, Toxo IgM) according to the Roche Diagnostic manufacturer's instructions.

Statistical Analysis: The suitable statistical methods were used in order to analyze and assess the results, they include the followings:

Descriptive statistics: Statistical tables including observed frequencies with their percentages.

Inferential statistics: These were used to accept or reject the statistical hypotheses, Persons Chi-Square test (χ^2) at level of significance 0.05.

P value < 0.05 level of significance was considered statistically significant.

Results: A total of 110 pregnant women were enrolled and screened for the presence of anti- toxoplasma IgG and IgM antibodies. The seroprevalence of *Toxoplasma gondii* IgG and IgM antibodies are given in Table (1) the result revealed that 40 (63.4 %) of 110 pregnant women were positive for anti-toxoplasma-antibody IgG and 70 (63.6 %) of 110 were negative for anti-toxoplasma-antibody-IgG while revealed that 16 (13.6 %) of 110

pregnant women were positive for anti-toxoplasma-antibody IgM and 94 (86.4 %) of 110 were negative for anti-toxoplasma-antibody IgM.

Table (1): Distrubution according to the seropositivity rates by ELISA (IgG, IgM) of pregnant women:

ELISA Result	Positive %	Negative %	Total
Anti-Toxo-Ab (IgG)	40 (36.4)	70 (63.6)	110 (100.0)
Anti-Toxo-Ab (IgM)	16 (13.6)	94 (86.4)	110 (100.0)
Persons	0.000	0.000	0.000
Chi-Square	S.	S.	S.

P-Value < 0.05

(Significant = S. , Non-significant = N.S.)

In Table (2) show the seropositivity was observed higher in the age group between 20 to 30 years 26 (37.1), 12 (17.1) for Toxo-IgG , IgM respectively whereas it was lower for other age group. The seropositivity rates among women according to their level of education show in table (3) the highest rates were recorded for anti-IgG, IgM antibody 30 (33.0 %) and 11 (12.1 %) respectively for literacy. In the prevalence of anti-Toxo- IgG Ab and anti- Toxo- IgM Ab were found to be higher in rural area 30 (40.0 %) and 10 (13.3 %) respectively than in urban show in Table (4). The highest rates of seropositivity among previously aborted was recorded in women with only previously aborted which was 20 (46.5 %) for Anti-Toxo- IgG Ab and 7 (16.3 %) for Anti-Toxo- IgM Ab show in table (5). The rate of seropositivity of *Toxoplasma gondii* among women who had cats as pet animal was significantly higher 28 (70.0 %) for Anti- Toxo- IgG Ab and 11 (27.5 %) for Anti-Toxo- IgM Ab show in table (6).

Discussion: *Toxoplasma gondii* leads to many serious health complications, it has been estimated that one third of the world population is infected by *Toxoplasma gondii*⁽¹⁵⁾. In the present study the seroprevalence of anti-IgG and IgM antibodies in pregnant women are 40 (36.4 %) and 16 (13.6 %) respectively this show in table (1). A slightly higher prevalence was reported by Munoz et al.⁽¹⁶⁾, Paschale et al.⁽¹⁷⁾, Kamal et al.⁽¹⁸⁾. And there is significant differences between anti-IgG , IgM antibodies (P < 0.05). Table (2) show the seropositivity was observed higher in the age group between 20 to 30 years, whereas it was lower for other age group which is similar to those found with the study of Malarvizhi et al.⁽⁹⁾, Hung et al.⁽¹⁹⁾, Bahaeldin et al.⁽²⁰⁾.

Table (2): The seropositivity rates by ELISA Toxo . IgM and Toxo. IgG according to age groups (Years).

Age Groups	Toxo IgG		Total	Toxo IgM		Total
	Positive %	Negative %		Positive %	Negative %	
< 20	4 (40.0)	6 (60.0)	10 (100.0)	0 (0.0)	10 (100.0)	10 (100.0)
20 - 30	26 (37.1)	44 (62.9)	70 (100.0)	12 (17.1)	58 (82.9)	70 (100.0)
31 - 40	10 (40.0)	15 (60.0)	25 (100.0)	3 (12.0)	22 (88.0)	25 (100.0)
> 40	0 (00.0)	5 (100.0)	5 (100.0)	0 (00.0)	5 (100.0)	5 (100.0)
Total	40 (36.4)	70 (63.6)	110 (100.0)	15 (13.6)	95 (86.4)	110 (100.0)
Persons Chi-Square	P = 0.380 N. S.			P = 0.368 N. S.		

P-Value > 0.05

Table (3): Association between IgG anti-Toxoplasma Ab and IgM anti-Toxoplasma Ab with the level of Education.

Level of Education	IgG anti-Toxo Ab		Total	IgM anti-Toxo Ab		Total
	Positive %	Negative %		Positive %	Negative %	
illiteracy	10 (52.6)	9 (47.4)	19 (100.0)	5 (26.3)	14 (73.7)	19 (100.0)
literacy	30 (33.0)	61 (67.0)	91 (100.0)	11 (12.1)	80 (87.9)	91 (100.0)
Total	40 (36.4)	70 (63.6)	110 (100.0)	16 (14.5)	94 (85.5)	110(100.0)
Persons Chi-Square	P = 0.121 N. S.			P = 0.148 N. S.		

P-Value > 0.05

Table (4): Association between the seropositivity rates by ELISA (IgG, IgM) and the residence.

Residence	Anti-Toxo Ab (IgG)		Total	Anti-Toxo Ab (IgM)		Total
	Positive %	Negative %		Positive %	Negative %	
Urban	10 (28.6)	25 (71.4)	35 (100.0)	4 (11.4)	31 (88.6)	35 (100.0)
Rural	30 (40.0)	45 (60.0)	75 (100.0)	10 (13.3)	65 (86.7)	75 (100.0)
Total	40 (36.4)	70 (63.6)	110 (100.0)	14 (12.7)	96 (87.3)	110 (100.0)
Persons Chi-Square	P = 0.291 N.S.			P = 1.000 N.S.		

P-Value > 0.05

Table (5): Association between the seropositivity rates by ELISA (IgG, IgM) and the number of previous abortion.

No. of Previous abortion	Anti-Toxo Ab (IgG)		Total	Anti-Toxo Ab (IgM)		Total
	Positive %	Negative %		Positive %	Negative %	
one	20 (46.5)	23 (53.5)	43 (100.0)	7 (16.3)	36 (83.7)	43 (100.0)
two	11 (64.7)	6 (35.3)	17 (100.0)	7 (41.2)	10 (58.8)	17 (100.0)
Three	1 (100.0)	0 (00.0)	1 (100.0)	1 (100.0)	0 (00.0)	1 (100.0)
No Abortion	8 (16.3)	41 (83.7)	49 (100.0)	1 (2.0)	48 (98.0)	49 (100.0)
Total	40 (36.4)	70 (63.6)	110 (100.0)	16 (14.5)	94 (85.5)	110 (100.0)
Persons Chi-Square	P = 0.000 S.			P = 0.000 S.		

P-Value < 0.05

Table (6): Distrubution according to the seropositivity rates by ELISA (IgG, IgM) of Pregnant women contact with cats and domestic animals.

Contact with	Anti-Toxo Ab (IgG)		Total	Anti-Toxo Ab (IgM)		Total
	Positive %	Negative %		Positive %	Negative %	
Cats	28 (70.0)	12 (30.0)	40 (100.0)	11 (27.5)	29 (72.5)	40 (100.0)
Domestic Animals	2 (100.0)	0 (00.0)	2 (100.0)	1 (50.0)	1 (50.0)	2 (100.0)
No Animal	10 (14.7)	58 (85.3)	68 (100.0)	4 (5.9)	64 (94.1)	68 (100.0)
Total	40 (36.4)	70 (63.6)	110 (100.0)	16 (14.5)	94 (85.5)	110 (100.0)
Persons Chi-Square	P = 0.000 S.			P = 0.003 S.		

P-Value < 0.05

There is non-significant differences between age group and anti-IgG, anti-IgM antibodies ($P > 0.05$). The seropositivity rates among women according to their level of education show in table (3) the highest rates were recorded for anti-IgG, IgM antibody 30 (33.0 %) and 11 (12.1 %) respectively for literacy while in illiteracy the rate was 10 (52.6 %), 5 (26.3 %) respectively the association between IgG anti Toxoplasma Ab and IgM anti-Toxoplasma Ab with the level of education statistically non-significance difference ($p > 0.05$) this agreement with Malarvizhi et al. ⁽⁹⁾. In the prevalence of anti-Toxo- IgG Ab and anti-Toxo- IgM Ab were found to be higher in rural area 30 (40.0 %) and 10 (13.3 %) respectively than in urban people and agree Wam et al. ⁽²¹⁾ show in Table (4). The highest rates of seropositivity among previously aborted was recorded in women with only previously aborted which was 20 (46.5 %) for Anti-Toxo- IgG Ab and 7 (16.3 %) for Anti-Toxo- IgM Ab show in table (5) agree with Saif et al. ⁽²²⁾. And significance differences between the association ($p < 0.05$). Although cats are the main host for Toxoplasma but is not the main route of infection worldwide ⁽¹⁾. The rate of seropositivity of Toxoplasma gondii among women who had cats as pet animal was significantly higher 28 (70.0 %) for Anti-Toxo- IgG Ab and 11 (27.5 %) for Anti-Toxo- IgM Ab show in table (6) than without any cat in their house this finding is in accordance with those reported by other workers Abamecha and Awel ⁽²³⁾ Saif et al. ⁽²²⁾. And statistically there is significance differences between the pregnant women who has cats ($p < 0.05$).

Conclusions: In conclusion the present study shows that anti-Toxoplasma IgG Ab are higher than anti-Toxoplasma IgM Ab in pregnant women between the age group 20 to 30 years in literacy educational level and rural area also recorded the highest rates of seropositivity among women with only one previously abortion in contact with cats are more affected.

Recommendation: Women should be encouraged to perform tests for toxoplasmosis before and during pregnancy. There must be implementation of regular serological testing pregnancy is important to reduce the effects of the disease on mother as well as on newborn babies and there must be an educational programmed for the general public as they are given to the pregnant women because the health information and health protection strategies should be relevant to the general people.

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