

Serological Study for the Detection of *Toxoplasma Gondii* in Women in the Karkh Side of Baghdad City

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Abstract: This study was conducted to reveal the rate of infection with *Toxoplasma* parasite in (96) blood samples from women examined by ELISA from (4) regions at Baghdad / Alkarkh during the period from -December 2025 to end of March 2025. will Total infection rate with *Toxoplasma* in women: The total infection rate with *Toxoplasma* in women's blood by ELISA IgG, IgM was 17 % (17/96) whereas ELISA, IgG rate recorded 14.58% (14/96), and ELISA, IgM recorded 3.12 % (3/96), such as Rate of infection with *Toxoplasma* in Women by ELISA (IgM) in relation to regions of study women at Abu Ghraib recorded higher rate of infection 10%(2/20) followed then Al-Aamiriya 4.17% (1/24) then Al-Saydiya) and finally Hayy Al-Jami'a 0%. ,as will Rate of infection with *Toxoplasma* in Women by ELISA (IgG) in relation to regions of study women at Abu Ghraib recorded higher rate of infection 20%(4/20) followed then Hayy Al-Jami'a 18.5% (5/27) then Al-Aamiriya 12.5%(3/24) and finally Al-Saydiya 8% (2/25) with a significant ($P < 0.01$) difference, this study was to determine the Result of ELISA revealed that women with age group (20-30) years recorded higher rate of Infection by-IGM (2/43) compared with (1/53) recorded by women with age group(31-40) years While the results of IgG (5/43) in the age group(20-30) were lower than the second age group (9/53).

Key points: *Toxoplasma gondii*, women, Elisa.

Introduction

Toxoplasma gondii is an obligate intracellular parasite with worldwide distribution inducing toxoplasmosis and infecting humans via warm-blooded animals. Wild and domestic felids are the only known definitive hosts with the ability to shed oocysts in their feces. Common pathways of infection include oocyst-contaminated water, soil, and food; tissue cysts in undercooked or raw meat; and congenital transmission [13, 20, 37, 43]. Oocysts are the environmentally resistant form of the parasite and play a key role in transmission to new hosts and ecosystems, generating the need to study humans alongside domestic and wild animal populations [43]. The large number of oocysts shed during primary-infection by felids could lead to extensive environmental contamination, which can infect a high number of intermediate species, such as humans, mice or birds. [26]. High rainfall rates can facilitate survival of oocysts for months, explaining why regions with higher precipitation show higher prevalence compared to arid regions, which show far lower rates of infection in the population living in these areas [1, 16, 25].

In Baghdad, the prevalence in the human population varies between 30% and 60% [6], and this high prevalence has been linked to the existence of a high density of urban stray cats, exposing people to an elevated density of oocysts [10]. This high density of free-ranging domestic cats can explain why cat ownership in homes does not increase the risk for *T. gondii* in surveys in some cities in Baghdad [29]. A study in Armenia city in 1998 found 89.3% seroprevalence in 28 domestic cats and detected a 66.6% shedding prevalence of *T. gondii*-like oocysts by microscopy in fecal samples from 18 cats [30]. In 2006, another study found a seroprevalence of 84.8% in 33 stray cats, but no oocysts were identified by microscopy in feces collected from the rectum from these cats [10]. Although training

helps with identification of *T. gondii*-like oocysts, morphological structure along cannot confirm that the oocysts visualized are actually *T. gondii*, as *Hammondia* oocysts for example look identical [11]. Consequently, molecular detection-based methods, like PCR, can be an alternative and complementary method to microscopy to identify cats infected with *T. gondii*. As a consequence, the objective of this study was to determine the prevalence of *T. gondii* DNA in cat fecal samples by conventional PCR and to analyze the ROP18 gene from positive samples in Armenia, Quindío, Colombia.

Methodology Sample

Serological examinations

Enzyme linked immunosorbent assay Indirect (ELISA) was done according to the instructions of the manufacturer's Human Gesellschaft Fur Biochemical and Diagnostic /Vircell. S.L / Spain as follows:

1. Added 100 µl of samples dilution solution into all wells and added 5µl of each serum and shake for 2 min.
2. Covered with a sealing sheet and incubated at 37°C for 60 min.
3. Removed the seal, aspirated liquid from all wells and washed five times with 0.3 ml of washing buffer per well.
4. Drained off any remaining liquid.
5. Immediately added 100 µl of reconstituted conjugate (prepared as described above) into each well.
6. Covered with a sealing sheet and incubated at 37°C for 60 min, and for IgG 45 min.
7. Removed the seal, aspirated liquid from all wells and washed five times with 0.3 ml of washing per well.
8. Immediately added 100 µl of substrate solution (tetramethyl benzidine) into each well.
9. Incubated at 24 °C for 20 min. and protected from light.
10. Immediately added 50 µl of stopping solution into each well.
11. Read with a spectrophotometer at 450 / 620 nm within 1 hour of the stopping reaction.

Results and Discussion:

Serological diagnosis

ELISA (IgG, IgM) in women

1. Total infection rate with *Toxoplasma* in women

The total infection rate with *Toxoplasma* in women's blood by ELISA IgG, IgM was 17.70 % (17/96) where, IgG recorded 14.58% (14/96), and IgM 3.12 % (3/96) with significant ($P \leq 0.01$) difference. (Table,1).

Table (1): Total infection rate with *Toxoplasma* - in women by ELISA IgG and IgM.

ELISA	No. of women examined	Positive	Percentage (%)
IgG	96	14	14.58
IgM		3	3.12
χ^2	66.27**		

** $P \leq 0.01$

The serological test was beneficial for the diagnosis of *Toxoplasma gondii* by detecting antibodies in serum and determining the phase of infection in acute and chronic phases (**Ataeian and Tadayon, 2000**). It has been shown that IgM antibodies appear earlier and decrease more quickly than IgG and are frequently the first class of antibodies detected after primary infection (**Kadhim, 2013**). This study record total rate of infection with *Toxoplasma* in women blood 17.7% (17/100), this result was close agreement with **Al-Sary (2014)** in Al Kut who recorded 17.8% rate and with **Razan and Hamad (2016)** in Kirkuk who recorded 16.13%, and nearest the rates recorded by **Al-Mosawi (2014)** and **Al-Ghezy (2012)** in Thi-Qar who recorded 21.94% and 23% respectively and disagreed with **Qazaz (2016)** and **Al-Sorchee (2005)** in Baghdad that recorded 78.33% and 80.6% rate of infection respectively and **Al-Doori (2010)** who recorded 49% in Tikrit, and **Hade et al. (2015)** in Baghdad (61.54%). The differences in the total rate of infection with *Toxoplasma* in women blood by serological test (ELISA) attributed to several factors such as the number of samples collected, kind of serological tests used also other factors related to the socioeconomic and cultural habits of community and close contact with cats as a final host of the parasite, and the environmental conditions that effect on the infection.

2. Rate of infection with *Toxoplasma* in Women by ELISA (IgG and IgM) in relation to areas of study.

Women in Abu Ghraib recorded a high rate of infection with ELISA IgM, IgG, 10% (2/20): 20% (4/20) then in Hayy Al-Jami'a 0.00%(0/27): 18.5% (5/27) followed by Al-Aamiriya 4.16%(1/24): 12.5%(3/24) and finally Al-Saydiya 0.00%(0/25): 8% (2/25) with a significant ($P \leq 0.01$) difference. (Tabel,4-6).

Table (2) The total infection rate with *Toxoplasma gondii* by ELISA in women in relation to areas of study.

Areas	No. of Women Examined	Positive	
		IgG(%)	IgM(%)
Abu Ghraib	20	4(20)	2(10)
Al-Aamiriya	24	3(12.5)	1(4.16)
Al-Saydiya	25	2(8)	0(0.00)
Hay Al-Jami'a	27	5(18.5)	0(0.00)
P-value	0.0374*		
χ^2	24.46**		

** $P \leq 0.01$

Bermani (2012) recorded the highest rate of infection in rural area (21.33%) and the lowest in urban (13.33%). A high infection rate may be due lack of health education with poor hygienic conditions (**Kadir et al., 2011**). Also, humans ingested sporulated oocysts are thought to become infected for life, with detectable and persistent IgG antibody levels specific for *Toxoplasma* and that has been aided the assessment of infection levels in many host species (**Dubey and Jones, 2008**). The epidemiology of toxoplasmosis is based on environmental conditions which can remain oocysts for months and years; Also, IgG is existed for long time in animals and can be found in different months or seasons of the year. The results are disagree with **Haj-Soleimani et al. (2012)** who determined that there was no significant impact related to the geographical areas. Also, **Al-Kabi (2016)** noted that the existence of cats is a principle important and no differences may be due to wide sources of infection, different in human population based on differences in culture habits (**Garcia et al., 2006; Gilot –Fromont et al., 2009**).

3. Infection rate of *Toxoplasma gondii* in women by ELISA in relation to age.

Results of ELISA are revealed that women with age group 20-30 years record a high rate of infection with ELISA –IgM 4.65% compared with age group > 30-40 years that recorded 1.88%, while ELISA IgG is showed an infection rate 11.62% in the age group 20-30 years and 16.98% in the age group 30-40 years with significant ($P \geq 0.01$) difference. (Table, 3)

Table (3): Total infection rate with *Toxoplasma gondii* in women by ELISA (IgM, IgG) according to age groups.

Age groups years	No. of samples examined	No. of positive-IgM / (%)	No. of positive IgG / (%)
20-30	43	2 (4.65)	5 (11.62)
>30-40	53	1 (1.88)	9 (16.98)
χ^2		42.22**	

** $P \geq 0.01$

The highest infection rate was recorded in women in the age group ranged between 20-29 years old (19.9%), but without significant ($P \geq 0.05$) difference (AL-Sray, 2014). In Ethiopia, Negero *et al.* (2017) pointed higher rate of infection in the age group 36-44 years old compared to lower in age group 15-25 years old. On the other hand, Tammam *et al.* (2013) recorded the higher infection rate in the age group <25 years old and lower infection rate in age group more than 40 years 42.1%, 1.1%, respectively. Ali (2018) in a survey for Toxoplasmosis in women, different infection rates were recorded in blood by using different diagnostic methods (LAT, ELISA, and PCR) 30.43%, 13.04 %, and 10% respectively; A high infection rate (40.47%) in the age group between 25-35 years old, followed by the age group 15-25 years old (23.25%) and finally the age group >35 years old (14.28%) by LAT, while by using ELISA a high same infection rate (14.28%) in the age groups 25-35 and >35 years old and the low infection rate (11.62%) in the age group between 15-25 years' old. The differences between the present results and the previous studies mentioned before may be due to consumption of undercooked meat, particularly pork and lamb, which has been ascribed to be the major risk factor for the acquisition of toxoplasmosis. Improved animal husbandry practices, as well as, increased awareness of the risks of consuming undercooked meat, resulted in the decreased prevalence of Toxoplasmosis worldwide Tenter *et al.* (2000). In the environment, cats and other felids (wild and domestic pets) present everywhere, cat feces, and infective oocysts can be present anywhere in the outside environment (soil, water, animal feed, contaminated human food such as berries, salad.), that is the main infectious route (Dubey,2009).

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