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Toxoplasmosis Among Pregnant and Non-Pregnant Women Attending Al-Shifa Hospital In Gaza Strip, Palestine

Adnan Al-Hindi¹, Majdal J. Madhon², Doaa N. Abo-Karsh², Asmaa O. Mansor²

1. Medical Laboratory Sciences Department, Faculty of Health Sciences, Islamic University-Gaza,

2. Undergraduate students from the Medical Laboratory Sciences Department, Faculty of Health Sciences

ABSTRACT

The aim our work is to study the occurrence of toxoplasmosis among pregnant and non-pregnant in Gaza strip. In cross-sectional study 164 sample was collected from pregnant and non pregnant woman attending Al-shifa hospital. Quantitative investigation of each blood sample for the levels of the specific IgG and IgM of *T.gondii* was done for collected sample. The overall prevalence of Toxoplasma IgG was found 33.2% and Toxoplasma. IgM was found to be 21%. The highest rate of **IgG** (47.4%) was in age group from 35-45 years old and **IgM** was (40%) in age group 25 to 35 years old. The women residing in the East Gaza city had **IgG** (42.2%) but in **IgM** was(32.1%) in the women residing in the North and Midzone. The highest rate of **IgG** (57.1%) and **IgM** (42.9%) were noticed among the employed women. In conclusion the result of this study shows a significant high seroprevalence of toxoplasmosis infection in pregnant women, and an important association with different socioeconomic factors. It is recommended that *Toxoplasma gondii* should applied as a routine test in Gaza and further studies to determine the reality of the definitive host infection (cats) in Gaza.

Keywords: Toxoplasma, pregnant, prevalence, diagnosis, Gaza

*Corresponding Author Email: ahindi@iugaza.edu.ps

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INTRODUCTION

Toxoplasmosis is one of the most common and widespread parasitic infections but is relatively little known because in the majority of cases, infections are asymptomatic. The disease is usually a self-limiting infection due to a parasite called *Toxoplasma gondii*, and is often a recurrence of a mild infection that may be subclinical in that no signs or symptoms are apparent.^{1,2} *Toxoplasma gondii* (*T.gondii*), is an obligate intracellular parasite found in humans and many warm blooded animals, but complete its sexual cycle producing oocysts only in the intestinal tract of cats.³

T. gondii is a protozoan parasite which belongs to the phylum *Apicomplexa*, subclass *Coccidiasina* and family *Sarcocystidae*.^{4,5} The infective stages of the parasite can take three different forms – sporozoites, tachyzoites and bradyzoites. Following sporulation in the environment, oocysts containing sporozoites are infective, and give rise to tachyzoites when ingested by an intermediate host. Most species of mammals and birds are susceptible to infection and may serve as an intermediate host.^{6,7,8}

Cats shed the environmentally resistant oocysts in their feces which can lead to human infection when they ingested a soil via uncooked fruits or vegetables contaminated with water containing the pathogens.⁷

Transplacental transmission of *T. gondii* occurs in approximately 40% of pregnancies in which the mother is exposed for the first time during the course of the pregnancy.⁹ If the fetus is infected during the first trimester, clinical manifestations are significantly more severe and may result in spontaneous abortion of the fetus. Infection during the second trimester also may result in a symptomatic infection, but the clinical manifestations vary from mild to severe and depend on individual factors.¹⁰

The situation of toxoplasmosis in Gaza Strip is not so clear but its existence cannot be excluded. Some literature on this subject has been published, but three studies has been carried out in Gaza, where this study included the screening of Gaza reproductive-age women for toxoplasmosis and is found that the number of positive results with antibody titers >1/32 represented 58.9 % of the total number of tested specimens, where the subjects who had elevated antibody titers > 1/256 represented 24.9 % of the total positive results.¹¹

The overall prevalence of Toxoplasma IgG was found 17.9% and Toxoplasma IgM was found to be 12.8%. The age of the participant woman ranged from 16 to 45 years old; 216 came from Gaza city (69.2%) and the others reside in near villages 96 (30.8%). Most of the participants (59.0%) had secondary education level. Animal breeding was reported for 33.3% of the aborted women.¹² Cats seen with high density in Gaza and can roaming easily among houses, streets and inside hospitals where it constitutes high risk to the community.

The objective of the current work was to identify the seroprevalence of anti-*Toxoplasma* IgG and IgM antibodies among pregnant and non-pregnant women in Gaza city and to determine the risk factors associated with toxoplasmosis.

MATERIALS AND METHOD

Ethical considerations:

Ethical approval was obtained from the Ministry of Health dated (9-11-2014) in addition to the informed consent from each woman.

Type, setting and period of the study:

A cross-sectional study was carried out between Aug, 2014 to June 2015 including pregnant and non-pregnant women attending antenatal clinic in Al-Shifa Hospital in Gaza strip.

Sample size and sampling

Two hundred blood samples were drawn from the following population groups:

- A. Hundred pregnant women**, aged 17-45 years reporting to Al- Shifa Hospital.
- b. Hundred non-pregnant women**, aged 17-45 years reporting to Al- Shifa Hospital.

Selection criteria of Woman:

The age of woman rank was : 17-45 years old and women who never had abortion

Specimen's collection:

Blood collected by venipuncture was allowed to clot, and serum was separated by centrifugation and kept at -20°C.

Serological testing:

Serum specimens were tested by ELISA to detect anti-*Toxoplasma* IgG and IgM antibodies using ELISA TOXO IgG and IgM (DRG, Diagnostics, Germany) according to manufacturer's instructions. The cut-off value of the assay was calculated and results were expressed as value 50 IU/ mL for IgG and 25 DU/ mL for IgM. The test was considered negative if the index was < 45 IU/ mL for IgG and < 23 DU/ mL for IgM, the result was equivocal when index was from 45-55IU/ mL for IgG and 23-28 DU/ mL for IgM. While the positive result was if index was >55 IU/ML for IgG and >28 DU/mL for IgM. A negative reaction indicates absence of significant *Toxoplasma* antibodies. A positive *Toxoplasma* IgG reaction was interpreted as an indication of either a past or recent infection. Each well was reading at optical density at 450/620nm in ELISA Reader.

Questionnaire:

All participants were interviewed, the questionnaire containing demographic, social (age, residence, marital status, occupation, education level), questions regarding zoonotic characteristic, Habits and sanitation (cat presence in the house, eating raw meat,

undercooked meat, washing vegetables before eating). Previous abortion, pregnancy status, medical symptoms, and children malformations.

Statistical analysis: Data obtain was computerized, simple distribution of study variables, the cross-tabulation, Chi square test was used to identify the significance of the relationships by SPSS program.

RESULTS AND DISCUSSION

The sociodemographic characters

Table 1. shows that the age of the women was ranged from 17 years old to 44 years old, the age group 25-34 represented the smallest (3.5%). Most women was found resident in West Gaza (57.0%) while the remaining were in other parts of Gaza Strip. Third of the women had a University education, while 96% were house wife. Also, 26% of women had >4 child in each house.

Table 1: Socio-demographic characteristic (n=200)

Variable	Number	%
Age		
17-24	98	49.0
25-34	7	3.5
35-44	95	47.5
Residency		
West Gaza	114	57.0
East and south Gaza	51	25.5
Middle and north	35	17.5
Education level		
Primary and Junior high	46	23.0
Secondary	89	49.0
University	56	28.0
Occupation		
House wife	192	96.0
Employee	8	4.0
Number of children		
<1	77	38.5
2-3	71	35.5
>4	52	26.0
Total	200	100

Zoonotic characteristics, Habits and sanitation

The zoonotic characters, habits among the participants and sanitation are indicated in table 2. Keeping cats in the house is un-usual issue among Gaza women but 11.0% did that. Eating both raw meat and vegetables without washing by those women showed a negative response. Half of the women were pregnant (50%), and 38.0% were found in the third trimester (Table 2.).

Table 2: Zoonotic characteristic, Habits and sanitation (n=200)

Variable	Number	%
Cats presence in the house		
Presence	22	11.0
Absence	178	89.0
Presence other animals		
Presence	12	6.0
Absence	188	94.0
Raw meat eating		
Yes	0	0
No	200	100
Eating raw vegetables without washing		
Yes		
No	0	0
	200	100
Pregnancy		
Yes	100	50.0
No	100	50.0
Level of pregnancy		
First trimester	10	5.0
Second trimester	13	6.5
Third trimester	76	38.0

Seroprevalence of *Toxoplasma* IgG and IgM according to the sociodemographic characteristics

In the present study, a total of 164 women from Al-Shifa hospital were recruited and aged from 17 to 44 years. The highest rate of **IgG** (47.4%) was in age group from 35-45 years old and **IgM** was (40%) in age group 25 to 35 years old. The women residing in the East Gaza city had **IgG** (42.2%) but in **IgM** was (32.1%) in the women residing in the North and Midzone. The highest rate of **IgG** (57.1%) and **IgM** (42.9%) were noticed among the employed women. Women with primary and joiner level of education had **IgG** (43.6 %) but **IgM** was (27.4%), in the secondary level of education. Women residing in houses with a number of children from 2-3 child had high level of **IgG** (46.3%) and low level of **IgM** (29.8%) as shown in table3.

Table 3: Seroprevalence of *Toxoplasma* IgM and IgG according to selected characteristics

(n = 164).

Variable	<i>Toxoplasma gondii</i> IgG		<i>Toxoplasma gondii</i> IgM	
	Number	(%)	Number	(%)
Age				
17-25	30	37	16	19.8
25-35	0	0.00	2	40
35-45	37	47.4	24	30.8
	$\chi^2=8.511, p=0.033$		$\chi^2=3.354, p=0.499$	
The residency				

West and south	19	41.3	8	17.4
East	38	42.2	25	27.8
North and midzone	10	35.7	9	32.1
	$\chi^2= 3.565 , p =0.408$		$\chi^2= 7.39, p =0.097$	
Education level				
Primary and Joiner high	17	43.6	10	25.6
Secondary	33	41.8	22	27.8
University	17	37	10	21.7
	$\chi^2=1.943 , p =0.542$		$\chi^2= 1.429 , p = 0.836$	
Occupation				
House wife	63	40.1	39	24.8
Employee	4	57.1	3	42.9
	$\chi^2=0.926 , p = 0.574$		$\chi^2= 2.098 , p = 0.207$	
Number of children in each house				
>1	23	36.5	14	22.2
2-3	25	46.3	14	25.9
>4	19	40.4	14	29.8
	$\chi^2= 3.372 , p = 0.513$		$\chi^2= 0.931 , p = 0.854$	

The prevalence of IgG was high (42.1%) among women breeding cats in the house compared to women not-breeding but not reach the significance level. The same for breeding other animals in the house. Also no one found eating raw meat or raw vegetables. The prevalence of IgG was similar for both pregnant and not pregnant women (40.%) and (41.9%) and not reach the significance level. The high level of IgG was found among women who is in the third trimester of pregnancy (42.9%) (Table 4.).

Seroprevalence of *Toxoplasma* IgG and IgM according to zoonotic characteristics and habits

Table 4: Seroprevalence of *Toxoplasma* IgM and IgG according to Selected characteristics

(n = 164).

Variable	<i>Toxoplasma gondii</i> IgG		<i>Toxoplasma gondii</i> IgM	
	Number	(%)	Number	(%)
Presence cats in house				
Yes	8	42.1	5	26.3
No	59	40.7	37	25.5
	$6.76 , P = 0.535 = \chi^2$		$P = 0.26 \ 0.987 = \chi^2$	
Presence other animals				
Yes	3	30	4	40
No	64	41.6	38	24.7
	$P = 0.520 \ 0.999 = \chi^2$		$3.290 , P = 0.195 = \chi^2$	
Eating raw meat				
Yes	00	0.00	00	00
No	67	40.9	42	25.6

	N.A		N.A	
Eating raw vegetable without washing				
Yes				
No	00 67	00 40.9	00 42	00 25.6
	N.A		N.A	
Pregnant				
Yes	36	40	21	23.3
No	31	41.9	21	28.4
	0.951 ,P = 0.100= χ^2		3.297 ,P =0.192= χ^2	
Level of pregnancy				
First trimester	2	25	1	12.5
Second trimester	3	27.3	4	36.4
Third trimester	30	42.9	16	22.9
	3.413 ,P =0.772= χ^2		,P =0.456 5.561= χ^2	

DISCUSSION

Toxoplasma gondii is still exists in our society and limited research were carried out during the last years. In our seroprevalence study indicated that IgG was (33%) and IgM (21%) among pregnant and non-pregnant women in Gaza strip. In a seroprevalence study it was found that the infection with *T. gondii* were IgG (25%) ,and IgM (12.5%) in the first trimester of pregnancy comparing with other studies as reported by ALjarosha.¹³ The overall IgG seroprevalence was 30.9% and IgM 5.8%, the mean age of pregnant was 25.6 years. Seroprevalence increased significantly with age 36-45 years P- value <0.001; while in our study low level of IgG but high IgM level. In the present study the seroprevalence gradually increases with age in 35 to 45 years old group IgG (47.3%) which was similar with Al-Nahari and Al-Tamimi study¹⁴ in Yemen with age from 25 to 35 years old IgG (45.3%). Other literature from West Bank of Palestine found that the seroprevalence of IgG antibodies to *T. gondii* was 27.9% while IgM seroprevalence was 17.6%¹⁵ which seems to be different slightly from our results.

Among the 487 studied pregnant women in Saudai Arabia, 38.8 % were seropositive for anti *T. gondii* IgG while 6.2 % were positive for anti *T. gondii* IgM and 3.3 % were positive for both anti *T. gondii* IgG & IgM¹⁶ and this was close to our findings.

In the present study the seroprevalence gradually increasing by work status for IgG (57.1%) working women and IgM was (42.9%) compared with Aqeely et al.,¹⁷ in Saudi Arabia of work status in IgG (12.0%) and IgM (2.0%).

In the present study the seroprevalence of IgG and IgM was associated to level of education in women at primary and junior high IgG was (43.6%) and IgM (25.6%) and compared with Deji-Agboola et al.,⁽¹⁸⁾ in Nigeria where level of education in women at Primary and Junior high in IgG (30.4%) and in IgM (27.2%).

In our study the seroprevalence increases with the presence of cat in house at IgG (42.1%) and in IgM (26.3%) but no significant difference ($P=0.535$) compared with Yad Yad *et al.*,¹⁹ in Iran presence of cat in house IgG was (57.6%) and IgM was (1.8%) (%). In our study the seroprevalence in the presence of other animals in house IgG (30%) was found to be similar to the results of Al-Hindi and Lubbad²⁰ in Gaza IgG (28.7%). The seroprevalence regarding the number of children in house from 2 to 3 IgG presented (46.3%) compared with Agmas *et al.*,²¹ results in Northwest Ethiopia IgG was (12.3%). In the present study no one of the positive participants for *Toxoplasma* IgG was eating raw meat compared with Deji-Agboola *et al.*,¹⁸ results where IgG was (40.9%) and IgM (25.6%) in Nigeria.

For contracting toxoplasmosis and consuming uncooked meat and consuming raw vegetable among married women at birth age in Sana'a city, Yemen.²²

Eating raw meat is non-permanent habit among the Gaza population, this explain the non-existence of such habit. Little families prefer owing and breeding cats in their houses due to the risks may impose.

CONCLUSIONS

It is concluded that that seroprevalence of *Toxoplasma* is high among women in Gaza Strip, and susceptibility of infection of women either pregnant or not is still risky.

Recommendations

1. Making the tset IgG and IgM for *Toxoplasma gondii* as routine antenatal screening program to control congenital Toxoplasmosis
2. PCR is recommended in further studies due to the IgG and IgM non specific and not sensitive
3. *Toxoplasma gondii* parasite is very dangerous and must be diagnosed early to avoid abortion and congenital defect.

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