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Seroprevalence of Toxoplasmosis among pregnant women in Mosul City, Iraq

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ABSTRACT

Objective: The aim of this study was to estimate the seroprevalence of toxoplasmosis infection by using enzyme linked immunosorbent assay technique (ELIZA) among pregnant women in Mosul city, Iraq.

Settings: The study conducted in Al-Khansaa Teaching Hospital (teaching hospital in Mosul city, north of Iraq) during one year period, from January 2019 till December 2019.

Patients and method: This cross-sectional study was conducted involving 380 pregnant women. IgG and IgM antibodies against T. gondii were measured by the Enzyme-linked immunosorbent assay (ELISA) test. SPSS version 21 statistical software was used for data analysis.

Result: By using enzyme-linked immunosorbent assay (ELIZA) technique, from 380 tested pregnant women, twelve women were seropositive (3.2%) with anti-toxoplasma IgM and 96 women were seropositive (25.2%) with anti-toxoplasma IgG, with a total seropositive (28.4%). There was a significant difference ($p < 0.05$) between seroprevalence of toxoplasma specific IgM and IgG during the first trimester which was the lowest (16.8%) and the third trimester during which it was the highest (40%). Also there was a significant difference regarding the prevalence of IgG and IgM antibodies between two age groups, (⩽ 20 – 25) years old with the highest incidence (38.6%) and (36 – 40) years old with the lowest incidence (14.5%) among pregnant women.

Conclusion: The results of this study indicated the relatively high prevalence of T.gondii infection among pregnant women in Mosul city. Therefore, screening tests can be done to minimize the risk of toxoplasmosis infection among women before marriage and pregnancy to decrease the incidence of abortions and different types of congenital anomalies.

Keywords: seroprevalence – toxoplasmosis – pregnancy – Iraq – toxoplasma gondii.

1. INTRODUCTION

Toxoplasmosis is a humans worldwide Infection, caused by an obligate intracellular parasite called Toxoplasma gondii (T. gondii) [(1-3)]. In developing countries about 30% of population has been exposed to T. gondii infection [(4,5)]. The definitive host for this parasite is the house cat while vertebrates are the intermediate host. Water, fruits and vegetables contaminated with oocytes, materno-fetal transmission and raw or undercooked meat are the most common mode of transmission [(6)]. Majority of human infections are asymptomatic but the signs and symptoms may occur, which are usually mild and the disease picture simulates some febrile infections [(7)].

The risk of infection transmission to the fetus in the pregnancy first trimester, is nearly 17% but its associated with severe complications and it usually leads to abortion. During the second trimester of pregnancy the infection risk of infection is about 25% and usually associated with microcephaly, hydrocephalus, mental retardation, and blindness. While high percentage of infection (65%) can occur during the third trimester of pregnancy, but usually its asymptomatic [(8-10)].

Generally, toxoplasmosis prevalence in the developed and developing countries among women at child bearing age is estimated to be between 30% to 60.8% (11). The prevalence of the toxoplasma gondii infection among pregnant women has been reported in America (31.7%), Sudan (34.1%), Austria (35%), Senegal (40.2%), Colombia (45.8%), and Paris (53.3%) [(12)].

In Iraq, there is many studies applied in different cities but there is no recent studies regarding Iraq's overall prevalence of Toxoplasmosis among pregnant women population. Toxoplasma gondii infection prevalence among pregnant women In Baghdad, Basrah, Sulaimania and Tikrit, were respectively 19.17%, 45.5%, 32.6%, 49% [13-16].

Generally, in our community the diagnosis of toxoplasmosis infection depends upon the serological tests, including serum latex agglutination tests and recently the enzyme-linked immune-sorbent assay (ELIZA) for toxoplasma-specific IgM antibodies (to diagnose the recent or active infection). Routinely the positive result of latex agglutination test in pregnant women will leads to long term therapy with anti-toxoplasma drugs like spiramycin antibiotic which can be associated with many side effects to fetus and mother in addition to the financial burden of such long term therapy. Unnecessary long term therapy can be reduced by differentiation of old toxoplasmosis from the active infection by using ELIZA technique which is the most sensitive and specific diagnostic technique [17,18].

The aim of the study: To estimate the prevalence of toxoplasma gondii infection among pregnant women in Mosul city, Iraq by using ELIZA technique.

MATERIALS AND METHODS

This study involved 380 pregnant women with history of abortions (spontaneous termination of pregnancy during the first 20 weeks of pregnancy), these women attended to the out patients clinic department in Al-Khansaa teaching hospital in Mosul city, north of Iraq, during a period extended from January 2019 till December 2019. Inclusion criteria in the study were:

1) Pregnant women with a history of single or repeated abortions.
2) Residing in Mosul city.
3) Age involved: < 20 - 40 years old.

By using a special Detailed questionnaire, clinical history was taken from each woman involving age, gravidity, parity, number of abortions and the fate of every pregnancy. The aim and the procedure of the study were fully explained to all participants and their informed consent gained.

Laboratory tests:

Blood samples (5 mL venous blood) were collected by venipuncture, at room tem-perature, centrifuged at 2000 rpm for 10 minutes. By micropipette, sera were transferred into separate test tubes and frozen at -20°C until analysis. The sera analyzed to detect IgG and IgM antibodies against T. gondii by using an enzyme-linked immune-sorbent assay (ELIZA) technique (Biokit Diagnostics Company, Spain). Both tests were performed following the instructions of the manufacturers.

Statistical analysis:

The statistical analysis was performed with the aid of the software: SPSS version 21 statistical software and Chi-square test for significant diff erences between two groups. A P value is considered to be significant if its less than 0.05.

RESULTS

The participants were 380 pregnant women with abortion history, the age range was (⩽ 20 – 40) years with a mean of (23.8) years. Sera from all participants (380 pregnant women) were tested by using (ELIZA) enzyme-linked immune-sorbent assay to detect specific anti-toxoplasma IgG, it was positive only in (96) pregnant women and this represents about (25.2 %), while the majority (284) of participants were negative (74.8%). For specific anti-toxoplasma IgM, it was positive only in (12) pregnant women and this represents about (3.2 %), while the majority (368) of participants were negative (% 96.8), with a significant difference between IgG and IgM results ($p < 0.05$) (Table 1).

The seroprevalence of Toxoplasma specific IgM and IgG during the first trimester was the lowest (16.8%) while it was the highest (40%) during the third trimester, with ($p < 0.05$) as shown in (Table 2).

Regarding the age distribution, this study showed that the prevalence of IgG and IgM antibodies were the highest (38.6%) among pregnant women aged (⩽ 20 – 25) years old while the prevalence of IgG and IgM antibodies were the lowest (14.5%) among pregnant women aged (36 – 40) years old, with a significant difference between these two age group ($p < 0.05$), (Table 3).

Table 1: Distribution of anti-Toxoplasma gondii IgM and IgG with their relative percentage by using ELIZA technique.

Toxoplasma IgG				Toxoplasma IgM				Total			
Positive		Negative		Positive		Negative		Positive		Negative	
n	%	n	%	n	%	n	%	n	%	n	%
96	25.2	284	74.8	12	3.2	368	96.8	108	28.4	272	71.7

ELISA, enzyme-linked immunosorbent assay, IgG, immunoglobulin G, IgM, immunoglobulin M.

Table 2: Pregnancy trimesters distribution of anti-Toxoplasma gondii IgG and IgM with their relative percentage by using ELIZA technique.

	Positive Toxoplasma IgG		Positive Toxoplasma IgM		Total	
	n	%	n	%	n	%
First Trimester (n = 178)	28	15.7	2	1.1	30	16.8
Second Trimester (n = 112)	38	33.9	4	3.6	42	37.5
Third Trimester (n = 90)	30	33.3	6	6.7	36	40.0

ELISA, enzyme-linked immunosorbent assay, IgG, immunoglobulin G, IgM, immunoglobulin M.

Table 3: Age distribution of anti-Toxoplasma gondii IgG and IgM with their relative percentage by using ELIZA technique.

Age group (Years)	Positive Toxoplasma (IgM)		Positive Toxoplasma (IgG)		Total	
	n	%	n	%	n	%
≤ 20 – 25 (n = 135)	6	4.5	46	34.1	52	38.6
26 – 30 (n = 105)	4	3.8	30	28.6	34	32.4
31 – 35 (n = 85)	2	2.3	12	14.2	14	16.5
36 – 40 (n = 55)	0	0.0	8	14.5	8	14.5
Total	12		96		108	

ELISA, enzyme-linked immunosorbent assay, IgG, immunoglobulin G, IgM, immunoglobulin M.

DISCUSSION

Toxoplasmosis infection importance belongs to its ability to cause repeated abortion, and different congenital abnormalities due to materno-fetal transmission during pregnancy [17,18]. In addition to its ability to cause remarkable morbidity and mortality among immune deficient patients [19, 20]. Therefore, this study was conducted to investigate the seroprevalence of anti-Toxoplasma IgG and IgM among pregnant women of Mosul city, north of Iraq.

Detection of anti-toxoplasma antibodies is the corner stone to diagnose toxoplasmosis laboratorically by using different diagnostic kits. In our locality, until recently, IgG antibody was an accepted indicator to diagnose toxoplasmosis and to start treatment. Only recently the detection of IgM anti-toxoplasma antibody became a common diagnostic indicator [21]. By using different kinds of serological and molecular tests, large number of studies had been conducted all over the world to assess the seropositivity of toxoplasmosis.

In current study, all 380 pregnant women tested by ELIZA technique, 96 women (25.2%) were positive for IgG, pointing to old or previous infection and 12 women (3.2%) were positive for IgM, indicating an acute infection. With a total seroprevalence of (28.3%) (Table 1). With a significant difference between IgG and IgM antibodies incidences ($P < 0.05$). Similar results were have been achieved in other studies done in Iraq [22,23], and other neighboring countries in tropical and subtropical region like Iran [24-26], Egypt [27] and Saudi Arabia [28]. These high seroprevalence may be due to the warm temperature climate in these countries that enhances toxoplasma gondii infections [6]. In addition to the increased incidence of contact with cats and toxoplasma gondii oocytes which shed in fesses of cats [29].

Other studies in different cities in Iraq, like Basrah and Tikrit showed higher toxoplasmosis seroprevalence in comparison to the results current study (14,16), these differences between the results of different studies and/or countries and cities may be due to nutritional and sanitation habits, abundance of cats, food preparation method, residence, sample size, age, sensitivity of laboratory test used and the medical education of the community [30,31].

Regarding infection distribution during pregnancy trimesters (Table 2). The current study pointed that the higher percentage of infection (40%) occurs during the third trimester while the least percentage (16.8%) occurs during the first trimester and these results agree with the result of many previous studies which indicated that toxoplasma gondii infection during the first trimester can be associated with severe congenital anomalies, abortion or even stillbirth [32-34].

Regarding the toxoplasmosis seropositivity among different age groups, the results of this study indicated a decrease in the toxoplasma gondii seroprevalence with increasing age. The younger age group ($\leqslant$ 20 – 25 years) was associated with the highest risk (38.6%) for T. gondii infection for both IgG and IgM, while the older age group (35 – 40 years) was associated with the least risk (14.5%) for T. gondii infection for both IgG and IgM. These results are in agreement with results from other studies that showed higher seroprevalence among same age group [35-37]. While other studied showed a higher seroprevalence among higher (25 – 30 years) age group (37,38). The high seroprevalence among this age group can be explained by generally low level of health education and awareness, high exposure to cats with low sanitary habits for cats in addition to socioeconomic and hygienic conditions [39,40].

Many studies indicated that improving of health education level and pregnant women's awareness T. gondii infection risk factors are successful and effective methods to decline the toxoplasmosis incidence [41,42].

CONCLUSION

The results of this study indicated the relatively high prevalence of T.gondii infection among pregnant women in Mosul city, although by comparison, the incidence is still lower than those incidences in other cities in Iraq and some other countries. The finding also pointed to the inverse relationship between the age of pregnant women and the T.gondii infection seroprevalence. Finally, the results of this study confirmed that the first trimester of pregnancy is associated with least toxoplasmosis incidence while the higher seroprevalence is associated with the third trimester. Throughout different regions, cities and countries, toxoplasmosis's prevalence shows obvious variations.

RECOMENDATION

1. The enzyme-linked immunosorbent assay (ELIZA) technique is strongly recommended for detection of specific anti-toxoplasma IgM for diagnosis of acute toxoplasmosis infection.
2. Treatment of toxoplasmosis should be limited to pregnant women who are IgM positive only.
3. Using of serological tests as routine screening tests to discover cases of toxoplasmosis among pregnant and non-pregnant women can greatly reduce the seroprevalence of toxoplasma gondii infection and subsequently the incidence of toxoplasmas' congenital anomalies.

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