

Seroprevalence of Toxoplasmosis in Aborted Women in Babylon Province, Iraq

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Abstract

Background: Toxoplasmosis is considered as one of the most prevalent human parasitic infections that can be transmitted from mother to the fetus. The onset of toxoplasmosis during pregnancy has clinical complications, including spontaneous abortion, preterm labor, stillbirth, and fetal abnormalities. **Objective:** The aim of this study was to investigate the seroprevalence of toxoplasmosis infection in aborted women. **Materials and Methods:** Seventy-five sera samples were collected from the women admitted in the obstetrics and gynecology ward with abortion. The blood samples were processed appropriately and tested for *Toxoplasma gondii* IgM and IgG using enzyme-linked immunosorbent assay (ELISA) technique, in addition to latex agglutination test (LAT) as a screening test. **Results:** Seropositivity of aborted women to *T. gondii* was 42.6% when used LAT while 4% and 22.6% when detection of *T. gondii* IgM and IgG respectively ELISA. the highest percentage of infection was found to be 18.6% in the age group of 21–25 years, in patients inhabited in rural area. Also seropositive in women with double frequent of abortion. **Conclusion:** ELISA test was the best method to investigate toxoplasmosis in aborted women, especially with recurrent spontaneous abortion.

Keywords: Aborted women, enzyme-linked immunosorbent assays, *Toxoplasma gondii*

INTRODUCTION

Abortion is the ending of a pregnancy by removal or expulsion of an embryo or fetus before it can survive outside the uterus. An abortion that occurs without intervention is known as a miscarriage or spontaneous abortion. When deliberate steps are taken to end a pregnancy, it is called an induced abortion or less frequently “induced miscarriage.” The unmodified word abortion generally refers to an induced abortion. A similar procedure after fetus has potential to survive outside the womb is known as a late termination of pregnancy or less accurately as a late-term abortion.^[1]

Toxoplasmosis is a zoonotic parasitic disease caused by the protozoan parasite *Toxoplasma gondii*. About 20%–90% of the world’s adult population in different regions is reported to have had contact with the parasite. *Toxoplasma* infection may be acquired orally or congenitally.^[2] The disease is important for its serious implications in immunosuppressed individuals, including pregnant women.^[3] It also has severe consequences on fetuses in congenital transmission.^[4] Toxoplasmosis is asymptomatic and is often associated with short self-limiting

illnesses in immunocompetent individuals.^[3] Congenital toxoplasmosis is a clinical state of the disease in the fetus that results from an acute primary infection acquired by the mother during pregnancy.^[5] The mother-to-fetus transmission rates vary according to gestational age at the time of maternal infection, and the severity of congenital toxoplasmosis varies with the trimester during which infection is acquired.^[6] Maternal infection in the first trimester of gestation results in a transmission rate of 10%–15%, which rises up to 68% in the third trimester.^[1] This implies that maternal infections occurring early in pregnancy are less likely to be transmitted to the fetus than infections acquired later in pregnancy. This can result in severe consequences such as spontaneous abortion, stillbirth, or the child may be born with some degree

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of abnormalities in the central nervous system, including hydrocephalus, mental retardation, and chorioretinitis.^[7]

Diagnosis of toxoplasmosis was performed through serological tests, such as dye test, enzyme-linked immunosorbent assays (ELISA), modified agglutination test, immunosorbent agglutination assay, indirect fluorescent antibody test, and indirect hemagglutination assays test, to detect different antigens or antibody classes;^[8] the incidence of primary maternal *T. gondii* infection during pregnancy ranges from about 1 to 310 per 10,000 pregnancies in different populations in Europe, Asia, Australia, and the Americas.^[1,6] The aim of this study was to detect the *T. gondii* infection in aborted women and to study the association prevalence of toxoplasmosis according to age, residency, educational level of women, and frequency of abortion.

MATERIALS AND METHODS

Sample collection

Seventy-five blood samples were collected from women admitted in the Obstetrics and Gynecology ward with spontaneous abortion. The blood samples were processed appropriately and tested for *T. gondii* IgM and IgG using ELISA technique, in addition to latex agglutination test (LAT) as screening test. About 3 ml venous blood samples were drawn from patients' arm using sterile disposable hypodermic vacutainer needles and tubes. Serum was obtained by centrifugation of venous blood at 14,000 rpm for 20 min and stored at -80°C until further use. A questionnaire was designed for data collection, which included all the required variables for analysis.

Latex agglutination test

A rapid LAT for qualitative and semi-quantitative detection of *T. gondii* antibodies in the serum was used, according to manufacturer's instructions. An agglutination of latex particles suspension will occur within 5 min for positive results.

Enzyme-linked immunosorbent assay

These tests were used for the detection of specific IgM and IgG antibodies against *T. gondii* antigen in patients' serum. Commercial anti-*Toxoplasma* antibodies detection ELISA kits (CTK Biotech, Inc., USA) were used according to the manufacturer's instructions.

Statistical analysis

Statistical analysis was carried out using SPSS version 21 (SPSS, IBM Company, Chicago, USA). Categorical variables were presented as frequencies and percentage. Continuous variables were presented as means with their 95% confidence interval. Pearson's Chi-square test was used.

RESULTS

The result in Table 1 show that the seropositivity of aborted women to *T. gondii* was 42.6% when use Lat while 4% and 22.6% when detection of *T. gondii* igm and igg respectively when use elisa.

Table 2 shows the percentage of infection with toxoplasmosis in aborted women according to the age group; the highest percentage of infection with toxoplasmosis was 18.6% at the age group of 21–25 years, followed by the age group of 26–30 years (12%). However, the lowest percentage of infection was 2.6% in the age group of 31–40 years, and there are significant differences using statistical analysis ($P < 0.05$).

The results of the present study show that the rate of toxoplasmosis was 5.3% in patients which uneducated, 24% in patients with elementary education while 6.6% and 1.3% in patient with secondary and university education, respectively [Table 3]. The percentage was in rural 25% and in urban 12%. Statistical analysis shows that there are significant differences between infection of toxoplasmosis with patients residences [Table 4].

Furthermore, the frequency of previous abortion was highest (17.3%) in patients having two previous abortions as shown in Table 5.

DISCUSSION

Maternal infection by *T. gondii* during pregnancy may have serious consequences for the fetus, ranging from miscarriage, central nervous system involvement, retinochoroiditis, or subclinical infection at birth with a risk of late onset of ocular diseases.^[7] The results of our study confirm that the prevalence of toxoplasmosis was 42.6% when used LAT test; this result was in accordance with the results of Al-Masoudi,^[9] who confirmed the infection rate of 49.7% when they used LAT method as a screening test for the detection of toxoplasmosis. LAT provides an excellent format for routine serological screening because of its high specificity, low cost, and easy to use, but this method cannot distinguish immunoglobulin classes and is not helpful in cases of suspected congenital infection when need to distinguish between maternal IgG from infants IgG response.^[10] Based on the findings of this study, the prevalence of anti-*Toxoplasma* IgG and IgM antibodies was determined using ELISA method in aborted women referred higher in IgG than IgM. The higher serum IgG levels in aborted women may indicate a higher rate of chronic stage of toxoplasmosis.

The results showed that the age distribution among toxoplasmosis infected women was between 21 and 25 years, which represents higher percentage of 18.6%, while the lowest percentage of infection (2.6%) in the aborted women was between 31 and 40 years [Table 2]. This finding was compatible to the results of a study in Al-Qadisiyah province, which found that 45.5% of aborted women were at 25–34 years,^[11] while other study found the highest rate of infection in the age group (16–19 years).^[12] These results may be due to the cumulative effect of exposure to the infective stages of the parasite. Women with a low educational level showed greater chance of being infected with *T. gondii*. Patients who had completed high school were clearly shown to be protected against anti-*T. gondii* seropositivity. Several other authors who

Table 1: Seropositive to toxoplasmosis in aborted women according to test

Test	Toxoplasmosis infected women (%)
LAT	32 (42.6)
ELISA IgM	3 (4)
ELISA IgG	17 (22.6)
Both IgM and IgG	13 (17.3)

ELISA: Enzyme-linked immunosorbent assays, LAT: Latex agglutination test

Table 2: Distribution of aborted women according to age group

Age group	Aborted women (%)	Toxoplasmosis-infected women (%)
<20	12 (16)	3 (4)
21-25	31 (41.3)	14 (18.6)
26-30	23 (30.6)	9 (12)
31-40	9 (12)	2 (2.6)
Total	75 (100)	28 (37.3)

Table 3: Distribution of aborted women according to educational level

Educational level	Number of aborted women (%)	Number of infected women (%)
Uneducated	9 (12)	4 (5.3)
Elementary	32 (42.6)	18 (24)
Secondary school	15 (20)	5 (6.6)
University	19 (25.3)	1 (1.3)
Total	75 (100)	28 (37.3)

Table 4: Distribution of aborted women according to residence area

Residence area	Aborted women (%)	Infected women (%)
Urban	27 (36)	9 (12)
Rural	48 (64)	19 (25.3)
Total	75 (100)	28 (37.3)

Table 5: Distribution of aborted women according to frequency of previous abortion

Frequency of previous abortion	Number of infected women (%)
1	8 (10.6)
2	13 (17.3)
3	7 (9.3)
Total	28 (37.3)

have studied toxoplasmosis among pregnant women have also found similar results.^[9]

The high percentage of toxoplasmosis in patients habited rural area compared to that in urban resident. There was a significant difference between them ($P < 0.05$) [Table 4]. This study agreed with previous study^[13], which found significantly

higher ($P = 0.01$) seropositive rural than urban. They showed that humans living in farms had significantly greater percentage of anti-*Toxoplasma* antibodies (59%) compared to urban dawdlers (41%). Regarding the residency of the patients and its relation with seropositive *Toxoplasma*,^[14] they showed that there was no significant difference between *Toxoplasma* antibodies distribution and both urban and rural areas. This result may be due to increasing trend of raw vegetable consumption and high usage of water that might have been contaminated with *T. gondii* oocyst.

The current study did not found a significant relationship between the percentage of infection and the number of abortions [Table 5], although it reported high rates of infection among women who experienced double abortion. The current study was compatible with the study by Nariman *et al.*^[15] who found that the number of abortions to two times higher than the number of abortions for once.

CONCLUSION

T. gondii considers one of the most common causes for abortion in pregnant women; the best diagnosis technique was ELISA; the highest frequency of toxoplasmosis was found in the age group ranging between 21 and 25 years especially in rural area.

Ethical clearance

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. The study protocol and the subject information and consent form were reviewed and approved by a local ethics committee.

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Conflicts of interest

There are no conflicts of interest.

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