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## Seroprevalence of toxoplasmosis among women with abortion in Khartoum State

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### ABSTRACT

**Objective:** To determine the prevalence of toxoplasmosis and infection among aborted women in order to establish basic knowledge for future pregnancy care.

**Methods:** A retrospective descriptive cross sectional hospital based study was conducted. A total of 95 pregnant women were enrolled in the study from Khartoum Teaching Hospital in the period from January 2012 to January 2013. The entire participant has history of abortion. The data were collected from the patient medical file. ELISA was used for *Toxoplasma gondii* (*T. gondii*) IgG and IgM using commercial diagnostic kit. Quantitative analysis for *T. gondii* antibodies IgG and IgM was performed, and the assay result interpreted as IU/mL. Data were analyzed using SSPS using the *Chi*-square test.

**Results:** A total of 95 participants were tested for *T. gondii* antibodies. Mean age was (29.93 ± 6.30) years old. *T. gondii* IgM was found reactive in 5 participants (5.3%), while 27 participants (28.4%) were found reactive for *T. gondii* IgG. It was found that the age group of 20-29 and 30-39 had a significant correlation with antibody sero-positive.

**Conclusions:** This study showed a high seroprevalence of *T. gondii* antibodies. Hence this study recommends implementing health program among pregnant women to prevent primary infection during pregnancy and regular surveillance of the disease among population all over the country.

## 1. Introduction

*Toxoplasma gondii* (*T. gondii*) is a protozoan with worldwide distribution[1]. Humans become infected through ingestion of food or water contaminated with oocysts shed by cats, eating under cooked or raw meat containing tissue cysts and by transplantations or by blood transfusions[2]. The cats are the final host to *T. gondii* and it is considered to be the major source of human infection[3,4]. Human-to-human transfer does not occur except from the primarily infected pregnant woman to her fetus, where transplacental transmission of the organism may lead to fetal infection and congenital toxoplasmosis[5]. The importance of toxoplasma from the perspective of public health is mainly due to the risk of disease transmission during pregnancy[6]. The rate of placental transmission

is between 17%-25%, when there is maternal infection during the first and second trimester and 65% when infection occurs during the third trimester from pregnant women[7]. Congenital toxoplasmosis is manifested in a classic triad of chorioretinitis, hydrocephalus and cerebral calcifications. Other features include microcephaly, neurological sequelae, hepatosplenomegaly, jaundice, anaemia and infantile nephrotic syndrome[8,9].

When the congenital toxoplasmosis occurs early in pregnancy, it may lead to severe damage or abortion[10,11]. A recent correlation study performed on a set of 88 countries has also shown that the prevalence of toxoplasmosis explains about 13% of the variation in the rates of congenital abnormalities between the countries[12]. Toxoplasmosis and cytomegalovirus infections constitute a major economic and public health problem in the world particularly in the developing countries including the Middle East because of the high rate of morbidity and mortality especially among pregnant women and immunocompromised individuals[13-17]. The prevalence of toxoplasmosis varies in different European countries and in some European countries the highest prevalence of this infection is seen[12,18]. The seroprevalence of *T. gondii* antibodies in pregnant

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women varies in different countries, it ranged from the 6.1% to 75.2% based on the geographical region[19]. This prevalence was seen as 7.6% in India, 21% in Pakistan and Bangladesh, 24%-75.7% in Tehran in Iran[19], 33% in Caribbean, 31% in Ireland, 55% in France, 46% in other European countries and 15%-41% in Africa[20].

In Sudan, toxoplasmosis was reported for the first time in 1966, with different prevalence rates according to the regions and the people's habits[21]. Toxoplasmosis can be diagnosed serologically in pregnant women by several testes that depend on the demonstration of anti-toxoplasma antibodies in the serum[22-25]. During the acute course of infection, toxoplasma antigen in the serum and other body fluids of the patients can be detected. ELISA is widely used for serodiagnosis of toxoplasmosis especially for detecting late antibody response to toxoplasma[26-28].

Maternal toxoplasmosis is usually asymptomatic and when the diagnosis is delayed, irreversible fetal damage may take place. During pregnancy, a serological survey represents a valuable way to the diagnosis in the neonate and may bring effective and rapid treatment of an affected child. All pregnant women should be tested at booking and sero-negative women followed at intervals for evidence of sero-conversion. Basic data are essential to develop an appropriate strategy for control, prevention and treatment of toxoplasmosis. Therefore, the aim of this study was to determine the seroprevalence of *T. gondii* immunoglobulin G (IgG), immunoglobulin M (IgM) antibodies in women with history of abortion in Khartoum State, to emphasize its consequences and correlate the finding with the age groups.

## 2. Materials and methods

A retrospective descriptive cross sectional hospital based study was conducted. A total of 95 pregnant women were enrolled in the study from Khartoum Teaching Hospital from January 2012 to January 2013. All participants had history of abortion. The data were collected from the patient medical file with help of the physician. About 5 mL of venous blood was drawn in disposable syringes under sterile aseptic technique in plain tubes, allowed to clot and centrifuge at room temperature. Then sera were capped and stored at -20 °C till analysis. ELISA was used for testing toxoplasma (IgG and IgM) by commercial diagnostic kits. Quantitative analysis for toxoplasma (IgG and IgM) was performed, and the assay result interpreted as IU/mL. The manufacturer's instruction was followed for the cut-off points; < 45.0 IU/mL was considered negative for toxoplasma IgG and < 23.0 IU/mL was considered negative for toxoplasma IgM. The hospital was informed for the purpose of the study, and the necessary ethics guidelines were followed. Permission to carry out the study was taken from the Scientific Research Committee, Khartoum University. Data were analyzed using SSPS and cross tabulated for descriptive and analytical statistics by using the *Chi*-square test.

## 3. Results

In the present study, the mean age (mean  $\pm$  SD) of the aborted women was (29.93  $\pm$  6.30) years. About 27 samples (28.4%) were seropositive for anti *T. gondii* IgG and 5 (5.3%) were seropositive for

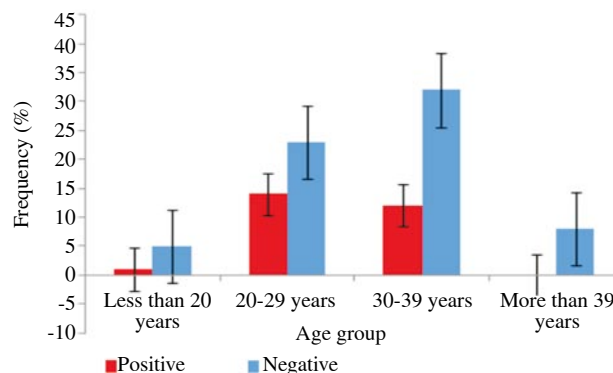
anti *T. gondii* IgM (Table 1).

**Table 1**

Seroprevalance of toxoplasma IgG and IgM antibodies [n (%)].

Type of antibody	Number tested	Positive	Negative
IgG	95	27 (28.4)	68 (71.6)
IgM	95	5 (5.3)	90 (94.7)

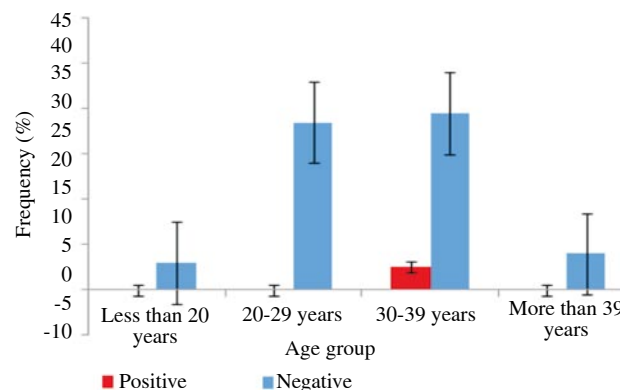
The distribution of positive serum samples among the different age groups for anti *T. gondii* IgG showed that pregnant woman of the age group 20-29 years had the highest prevalence (51.9%) of toxoplasmosis followed by the age group 30-39 years (44.4%), and then by the age group < 20 years (3.7%), while age group > 39 years showed no positive result for *T. gondii* IgG (Figure 1).



**Figure 1.** *T. gondii* IgG seroprevalence by age category in high-risk patients referred for toxoplasma testing in Khartoum Teaching Hospital between 2012 and 2013.

In our study, total seroprevalence of toxoplasma specific antibodies was found to be 12.5%. Among the 95 women in this study, 27 (28.4%) were positive for toxoplasma specific IgG antibodies, while 5 women were found positive for toxoplasma specific IgM antibodies. This is in accordance with the study done by Almushait *et al.*[29] and Hajssoleimani *et al.*[30] who reported *T. gondii* seroprevalence of 38.8% and 37.25% respectively.

As shown in Figure 2, distribution of positive serum samples among the different age groups for anti *T. gondii* IgM showed the age group 30-39 years had the highest percentage of toxoplasmosis. The other age group showed negative result for *T. gondii*. The different age group showed different frequency of recurrent abortion while age group 30-39 years showed the highest recurrence of abortion (Figure 2).



**Figure 2.** *T. gondii* IgM seroprevalence by age category in high-risk patients referred for toxoplasma testing in Khartoum Teaching Hospital between 2012 and 2013.

#### 4. Discussion

Toxoplasmosis is one of TORCH infection group (*T. gondii*, rubella, cytomegalovirus, herpes simplex), which is a worldwide obstetrical problem, where transplacental transmission of the infection may result in serious congenital diseases in the new born child. On worldwide scale, the seroprevalence of *T. gondii* in aborted women varies from 17.5% to 53.3%[25,31-33].

In this study, the rate of IgG anti-toxoplasma was (28.4%), which means that about 71.6% of pregnant women are at risk of acquiring the infection if they are exposed during pregnancy, and consequently could transmit the infection to the fetus. This rate of IgG antibodies sero-positive is close to the rate reported in Sudanese women previously (30.1%)[34]. Moreover, it is also close to the rate reported in Makkah, Saudi Arabia (29.4%)[35], Bahrain (21.8%)[36], Iran (34.4%)[37], Tanzania (30.9%)[38] and Palestine (27.9%)[39]. On the other hand, the finding of anti IgG is lower than that reported in Turkey (70.6%)[40] and in Brazil (58.5%)[41].

Toxoplasma IgM was observed in 5.3% of the aborted women. This reflects the risk among pregnant women with a recent infection who might transfer the parasite to the fetus. The negative anti-toxoplasma IgM (94.7%) may exclude cases with recent infection.

Our finding for toxoplasma IgM (5.3%) is close to those reported in study in Makkah, Saudi Arabia (5.6%)[35] and it was lower than that reported among Sudanese women (13%)[34] and in Bahrain (11.6%)[36].

Regional variations in the incidence of toxoplasma infection rates from one country to another or even within the same country, has been well documented. This variation has been attributed to climate, cultural differences regarding hygienic and feeding habits[42].

The anti-IgG seroprevalence of toxoplasma increased within the age group of 20-29 years, while anti-IgM seroprevalence of toxoplasma increased within the age group of 30-39 years.

The age group that had the highest percentage of positive result was between 20-29 years (51.9% for anti *T. gondii* IgG), latest age group  $\leq$  20 years (3.7% for anti *T. gondii* IgG and 0.0% for anti *T. gondii* IgM) (Figures 1 and 2).

The anti-IgG and anti-IgM seroprevalence of toxoplasma increased with age; older women are more susceptible to the parasite than younger women as a result of longer exposure time. These results confirm the fact that seroprevalence of toxoplasma is well known to increase with age, the greater the prevalence, the earlier the rise[43].

However, in this study, this relation may be explained by the older persons who have the longer time of exposed to the causing agent and may retain a steady level of toxoplasma antibody in serum for years. This is similar to previous study conducted in Makkah.

This study showed a high seroprevalence of *T. gondii* antibodies among aborted women in Khartoum State. Hence, this study recommends:

- Implementation of health extension program among pregnant women to prevent primary infection during pregnancy.
- Screening of women for toxoplasma antibodies before and

during pregnancy especially older group.

- Regular surveillance of the disease among population all over the country.

#### Conflict of interest statement

We declare that we have no conflict of interest.

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