

Toxoplasmosis among Iraqi women during 2006-2020: A review

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Abstract: The prevalence history for toxoplasmosis among Iraqi females is reviewed from 2006-2020. The distribution of the disease is mentioned in different communities including unmarried, married unpregnant or pregnant women suffered from miscarriage and women or children with malignant disease. The prevalence rates are also illustrated in relation to age and residency. Toxoplasmosis is the most common infections in Iraq. Thus, Iraq is endemic for the disease. It is zoonotic disease and cat is the only definitive host where both the sexual and asexual cycle takes place in the small intestine. Transmission can occur by contact with stray cats, eating raw or under cooked meat, unclean green vegetables and unpasteurized milk. Transplacental route during pregnancy would lead to a serious pathological effects or even death of the fetus. Those effects would include hydrocephalus or microcephaly, chorioretinitis, tremor, paralysis, convulsion, intracranial calcification and mental and physical growth retardation. The infected women may suffer from miscarriage and stillbirth. Immunocompromised women as well as girl patients due to cancer or its chemotherapy would suffer from a severe effect of toxoplasmosis. The most common diagnostic tool is the application of serological tests as ELISA. Implantation of a national control program is essential to apply.

Keywords: ELISA, Miscarriage, Pediatrics, Prevalence, Toxoplasmosis.

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Introduction

Toxoplasmosis is caused by an obligate intracellular parasite called *Toxoplasma gondii*. It is widely prevalent in human and animals in all countries in the world (1,2). It has a great public health problem in pregnant women as it can lead to transplacental transmission and involvement of the fetus with pathological effects.

The parasite is mainly transmitted by food contaminated with sporulated oocysts containing 8 sporozoites that are the product of sexual and asexual cycle in intestine which can be excreted by cats, which is the only definitive hosts, uncooked meat containing the bradyzoites or unpasteurized milk containing tachyzoite stage, and transplacentally (3,4).

congenital toxoplasmosis is the most serious clinical importance. It has a major public health awareness in pregnant women as it leads to transplacental transmission and involvement of the fetus with pathological effects including hydrocephalus or microcephaly, chorioretinitis, tremor, paralysis, convulsion, intracranial calcification and death. It can also lead to miscarriage, stillbirth, different degrees of mental or physical retardation and blindness (5-7).

The rate of this route of infection is between 17-25% during the first and second trimester and 65% when infection occurs during the third trimester from pregnant women. Thus, the early diagnosis is a crucial step to start treatment on time to minimize the transplacental transmission (8,9).

The main sign of acquired toxoplasmosis is lymphadenopathy, fever, anemia, anorexia, muscle pain and sore throat (10). Although the disease has no serious consequences in adults who are exposed to, women who are infected during pregnancy, are at risk for miscarriage, still birth, or serious birth defects. Thus, the diagnosis of toxoplasmosis must be performed before or as soon as pregnancy is diagnosed to determine the mother's history of exposure to the organism and monthly during the gestation period.

Toxoplasmosis can be diagnosis with different methods such as serological test, Molecular test, skin test, and histological demonstration parasite [11]. The serological test (ELISA) which is a widely used for detection the antibody of *Toxoplasma*, IgG for a chronic infection and IgM for acute infection (12). The seroprevalent toxoplasmosis in different countries is depend on the various factors such as, age, nutritional habitation, contact with cats, animals, and geographical condition (13).

The low epidemiology rate of toxoplasmosis of about 10-30% have been recorded in many countries included North America, South East Asia, and northern Europe and Sahelian countries of Africa. The rate of 30-50% have been reported in countries of Central and Southern Europe, while high epidemiological rate has been recorded in Latin America and tropical African countries (14).

In the Arabic countries, the seroprevalent shows different rates of infection as in Kuwait (58.2%) (15), Jordan (26%) (16), Saudi Arabia (25%) (17) and Egypt (81.4%) (18).

Results and Discussion

The seroprevalence rates of toxoplasmosis are reviewed according to the types of communities including general and selected populations in different Iraqi provinces (Figure 1). The work has been approved by the Ethical Committee of the College of Medicine, University of Basrah, Iraq.

Non-pregnant women:

Three surveys among unmarried medical students in Basrah and in nonpregnant women in Kurdistan-Iraq were done (Table 1). Prevalence rates ranged from 0.76%-1.13% and 11.3%-35.61% for IgM and IgG respectively (Table 1). This is giving an indication that even the students and unmarried women who are close to child bearing age are also infected by the parasite in the southern as well as northern parts in Iraq.

Women with miscarriage:

Although the prevalence rates of toxoplasmosis are varied from one area to another according to the degree of personal and community hygiene, sanitation and climatic factors are relatively common in Iraq (Table 2). The disease is prevalent among all types of communities and population samples from both urban and rural regions of Iraq. Adults and children of both sexes are infected. Even treatment is available; the morbidity is still high. So, it can be considered that Iraq is endemic for toxoplasmosis. Therefore, an urgent and efficient preventive and control measures are essential.

Women with vitamin D deficiency:

Vitamin D support maternal health and fetal development throughout gestation. Two studies in Kirkuk and Babylon have concluded that vitamin D deficiency would increase the possibility for exposure to toxoplasmosis in women (Table 3).

Women with malignancy:

Only 3 works have been done in Iraq concerning the relationship between cancer and toxoplasmosis in Baghdad and Basrah (Table 4).

The parasites are linked to various cancers, which may interfere with the host cell's genetic machinery and may result in immune system impairment and chronic inflammations (19,20). Many studies indicated that seroprevalence of toxoplasmosis is significantly higher in cancer patients having chemotherapy including breast cancer, HIV/AIDS and organ-transplant recipients than non-cancer patients (21-23).

It is also reported in immunocompromised patients with lymphatic leukemia [24,25] and bone marrow transplantation (26), where the toxoplasma cysts may reactivate and cause disseminated infection like encephalitis and can be fatal for immunocompromised patients (3,5).

Conclusion

Earlier researcher has revealed the infection was more frequent between those with raw meat, close contact with cats, vegetable consumption and low learning level.

Careful evaluation of the disease should be continued in different regions and among different societies. Implementing a national control program should include a primary health care, health education, water supply, environmental sanitation, nutrition, proper washing of green vegetables, well cooked meat, killing of stray cats and treatment for domestic cats in both the urban and rural areas. Routine practice by screening women just before get pregnant and monthly during pregnancy period must be applied. In addition, a great success would achieve when a vaccine is established and start using it for risky females.

Toxoplasmosis is regarded to play an important role in malignancy induction and must be further investigated as a probable oncogenic pathogenic agent to human beings. Therefore, women and girls with cancer must be anticipated and treated in order to reduce the suffering often faced by those patients.

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Table 1. Prevalence of toxoplasmosis among apparently healthy non- pregnant women.

Reference	No. examined	Apparently health women (Non-pregnant)	% prevalence	
			IgM	IgG
Al-Sadoon et al., (27)	177	Unmarried university female medical students aged 22-24 years in Basrah.	1.13	11.3
Mizuri& Mero, (28)	630	Married non-pregnant (535) and single (95) women aged 15-45 years in Zakho-Kurdistan.	0.74	12.52
			Single: 0	6.31
Salih et al., (29)	792	Married non-pregnant (666) and single (126) women aged 16-55 years in Duhok-Kurdistan.	0.6	39.3
			Single: 1.58	15.9

Table 2. Prevalence of toxoplasmosis among pregnant women.

Reference	No. examined	Pregnant women	% prevalence	
			IgM	IgG
Mossa, (30)	54	Pregnant women aged 16-45 years in Al-Kadhimia-Baghdad. Aborted 82%, stillbirth 18%.	33	94
Abduallah&Mohmood, (31)	263	Pregnant women aged 20-40 years were attending Maternal & Pediatric Hospital in Erbil-Kurdistan. Higher infection among rural region in comparison to urban region.	12.93	34.8
Mikaeel& Al-Saeed, (32)	650	Pregnant women aged 18-48 years in Duhok. 388 were aborted while 262 women not aborted. Rural infection was higher than urban area.	0.46	28.0
			Not aborted: 0	0
Raza et al., (33)	180	160 aborted and 20 unaborting women attending Kirkuk General Hospital aged 15-45 years.	20.63	0
			Not aborted: 0	0
Jwad et al., (34)	57	37 aborted and 20 unaborting (control) women attending Teaching Hospital in Karbala. Ages ranged 18-40 years.	2.7	96.7
			Control: 0.2	1.01
Al-Sray et al., (35)	500	Post miscarriage women attending Al-Kut Hospital in Wasit. Ages ranged 15-45 years. There was no significant as far as month of the year is concerned.	0.8	17.0
Al-Ethawi et al., (36)	100	Patients who had miscarriage and referred to Al-Zahraa Hospital in Baghdad. Their ages ranged <25-35 years.	0	55.0
Edrees& Ibrahim, (37)	150	Pregnant women in the city of Mosul with mean age 29.9±5.5 years.	0	26.7
Ali et al., (38)	500	470 aborted and 30 health control women attending Bent-Huda and Al-Hubboby Hospitals in Thi-Qar. Ages ranged 15-40 years. High seroprevalence was found in urban (26.5%) than rural area (16.5%).	4.52	36.4
Darweesh et al., (39)	150	100 women either aborted or had previous abortion and 50 control women from Al-Batool Maternity Teachin Hospital in Baqubah city-Diyala province. Ages ranged 14-55 years. There is no significant	4.0	38.0
			Control: 0	0

		differences between rural and urban areas.		
Al-Se'adawy, (40)	81	Aborted women with an ages of 15-39 years from Al-Muthanna province.	0	13/81
Hassan, (41)	255	210 aborted and 45 control women were attending Baghdad Teaching Hospital.	15.23	22.0
			Control:	
			0	6.66
Anwar & Al-Bayayati, (42)	173	Patients attending Samaraa General Hospital-Tikrit. Ages ranged 20-50 years.	24.9	13.3
Al-Mishhadani& Al-Janabi, (43)	350	240 women with history of abortion and 110 healthy women frm Al-Anbar province. Ages ranged 16-40 years.Toxoplasmosis as well as CMV infection are more prevalent among aborted women .	8.3	58.3
			Control:	
			2.7	36.4
Mohammed & Al-Janabi, (44)	75	Aborted women attending Babylon Hospital. Ages ranged 20-40 years.	4	22.6

Table 3. Prevalence of toxoplasmosis among women with vitamin D deficiency.

Reference	No. examined	Women with vitamin D deficiency	% prevalence	
			IgM	IgG
Tayeb et al., (45)	153	Women with single, habitual or stillbirth were involved. Ages ranged 15-50 years. They were attending Azadi Teaching Hospital in Kirkuk. Relationship between toxoplasmosis and vitamin D deficiency was significant.	35.0	49.0
			Control:	
			0	31.12
Al-Masoudi et al., (46)	203	175 aborted and 30 healthy women were examined in Hilla Surgical Hospital in Babylon. Their ages ranged 14-43 years. Results indicated that the levels of malondialdehyde, vitamin D and zinc may have an important role to increase possibility of exposure to toxoplasmosis in women.	0	34.2
			Control:	
			0	0

Table 4. Prevalence of toxoplasmosis among patients with malignant diseases.

Reference	No. examined	Patients with malignancy	% prevalence	
			IgM	IgG
Al-Toban et al., (47)	61	Patients with acute lymphoblastic leukemia arranged as 48 with induction chemotherapy, 13 post bone marrow transplantation and 30 healthy control group. Their ages ranged <20-60 years. They were attending Hematology ward at AL-Emamain AL-Kadhemain Medical City and Baghdad Teaching Hospital, Medical Complex, Iraq.	0	16.67
			Control:	
			0	0
Merdaw et al., (48)	141	81 women with breast cancer and 60 health were attending the Oncology Teaching Hospital in Baghdad. Their ages ranged 19-70 years. High level of IL-10 was found among women with breast cancer and toxoplasmosis	4.93	38.27
			Control:	
			0	26.66

		(10.24%) than women without toxoplasmosis (3.6%).	
Mahdi et al., (49)	200	30 children with epilepsy, 30 children with mental retardation and 40 leukemic children in Basrah province were examined for toxoplasmosis.	The rates of infection were 10%, 3.3% and 7.5% in children with epilepsy, mental retardation and leukemia respectively. Control: 2%.



Figure 1. Map for Iraqi provinces.