

## Epidemiology of Toxoplasmosis among Married Women at Birth Age in Sana'a City (Yemen)

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**ABSTRACT:** *Background:* The endemic of toxoplasmosis infection is considered high in Yemen, but there has been inadequate information on the prevalence rate and risk determinants among female at age bearing time in Yemen. This study shed some light on the epidemiology of Toxoplasmosis among women in Yemen.

The aim of the present study to determine the Seroprevalence of *T. gondii* antibodies among pregnant and non pregnant women in Sana'a city, its associated risks exposures as age, residence, education, history of abortion, contact with animals and undercooked meat or food.

*Method:* This study was a cross-sectional study, the size of sample was 200, after a questionnaire applied to the pregnant and none pregnant women, anti-Toxoplasma IgG, IgM antibodies were studied by (ECL).

*Results:* 86 samples 43% were seropositive for anti-Toxoplasma gondii IgG and six samples 3% were seropositive for anti-Toxoplasma gondii IgM.

In The positive samples (86) for IgG the mean age of the women was  $\geq 15$  years and, the rate was 5% for age group 15-19 years, 16% for 20-24 years, 22% for 25-29 years, 20% for 30-34 years, (20%) for 35-39% and 17% for  $\geq 40$  years and, the prevalence rate of IgG 48.3% for females who, had abortion and 38.9% for females who hadn't abortion. For the residency 66% of infection was in urban, 34% was in rural.

*Conclusion:* Increased Seroprevalence of Toxoplasmosis.

**KEYWORDS:** Endemic, Seroprevalence, Risk factors, *T. gondii* antibodies, ECL.

### 1 INTRODUCTION

Toxoplasmosis, being one of the torch's infection in pregnant women. It is Infection with the intracellular parasite *Toxoplasma gondii* causes serious public health problems, and it infect at least 500 million people worldwide [1].

The most infected individuals are asymptomatic; when these individuals in period of their lives suffer from immune deficiency (such as: AIDS, cancer and chemotherapy, etc.), they will have a recurrence of the disease. Cat is primary host of the parasite and developmental cycle of the parasite is processed in the cat's body [2].

It has been reported that toxoplasmosis is present in every country; the seropositivity rates range from less than 10% to over 90% [3], and the Seroprevalence of Toxoplasma infection widely differs, between 30% and 60%, in both developed and developing countries [4].

Transmission of *T. gondii* is usually by ingestion of cysts infected and undercooked or raw meat or by accidental ingestion of oocysts that may contaminate soil, water, and food. Meat is one of the most important sources of the infection in individuals [5].

Toxoplasmosis is also one of the infections that can be transmitted through placenta during pregnancy [6].

Women infected with *T. gondii* before conception rarely transmit the parasite to their fetus, but those who become acutely infected or have reactivation of *T. gondii* during pregnancy (i.e, because of immunosuppression) can transmit the parasites transplacentally.

The risk of congenital disease is lowest (10-25%) when maternal infection occurs during the first trimester and highest (60-90%) when maternal infection occurs during the third trimester [7]. However, congenital disease is more severe when infection is acquired in the first trimester [8].

The overall risk of congenital infection from acute *T. gondii* infection during pregnancy ranges from approximately 20-50% [9].

Toxoplasmosis is diagnosed in laboratory by immunological testing that give the titer of circulating antibodies, and in fetus toxoplasmosis based on direct identification of the parasite by inoculation of amniotic liquid and/or fetal blood in mice, as well as cell culture [10].

## 2 MATERIALS AND METHODS

A total of 200 pregnant and non pregnant women was examined by collect a blood sample for the period from April to September 2009 in Al-Thawra hospital and other medical centers to determine *Toxoplasma gondii* antibodies. Two sample for each woman was collected in tubes (5 ml), and stored.

The sera was separated by centrifugation at 4000 rpm for ten minutes in room temperature, stored at -20 OC until use. Full history was taken from each studied woman, and the findings were recorded in a predesigned questionnaire.

A questionnaire sheet was designed to evaluate some of the main risk factors, which may influence the prevalence of *Toxoplasma* infection among the expecting women volunteers. The risk factors considered in this study include age, residence (urban or rural), educational level (illiterate, primary, secondary, university).

The samples analyzed in medical laboratory in Althawra Hospital by ECL for serodiagnosis (IgM, IgG) of toxoplasmosis, statistical analyzed was perform by the software R, X2 of Pearson were used for comparison between variables. For all test the significance level was 0.05 also used Excel program.

## 3 RESULTS

The age distribution of females tested for Toxoplasmosis antibodies in Sana'a, Yemen (Table 1). Most of the females were in age grouped from 20-34 years. Only 8% of females were under age of 20 years (15-19yrs). Also 12.5% of our tested females were over 40 yrs of age. The distribution of age groups was significant  $X^2=22.42$ ,  $PV=0.0004356$ .

**Table 1. The age distribution of 200 females tested for toxoplasmosis antibodies in Sana'a city, Yemen.**

Age groups(years)	Number	%
15-19	16	8
20 – 24	42	21
25-29	50	25
30-34	37	18.5
35 – 39	30	15
≥ 40	25	12.5

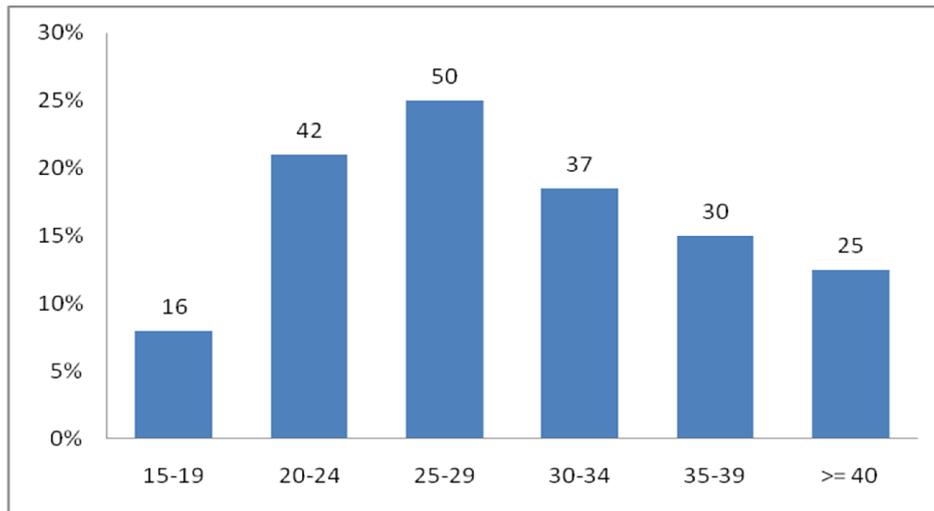


Fig. 1. The age distribution of 200 females tested for toxoplasmosis antibodies in Sana'a city, Yemen

The educational and residency status of females for Toxoplasmosis antibodies (Table2).. Concerning the educational statuses (38.5% )were illiteracy women,(20%)were had primary education , then(43%)were had secondary education and finally(40%) were had secondary education . The result was significant where  $X^2=19.56$ ,  $PV=0.000204$

Concerning the residency statuses (66%) was in urban, while (34%) was in rural and the variation between two rates was highly significant where  $X^2=20.48$ ,  $PV=6.026.10^{-6}$

Table 2.The educational and residency status of 200 females tested for toxoplasmosis antibodies in Sana'a city, Yemen.

Characters		Number	%
Education	Illiterate	77	38.5
	Primary	40	20
	Secondary	43	21.5
	University	40	20
Residency	Rural	68	34
	Urban	132	66

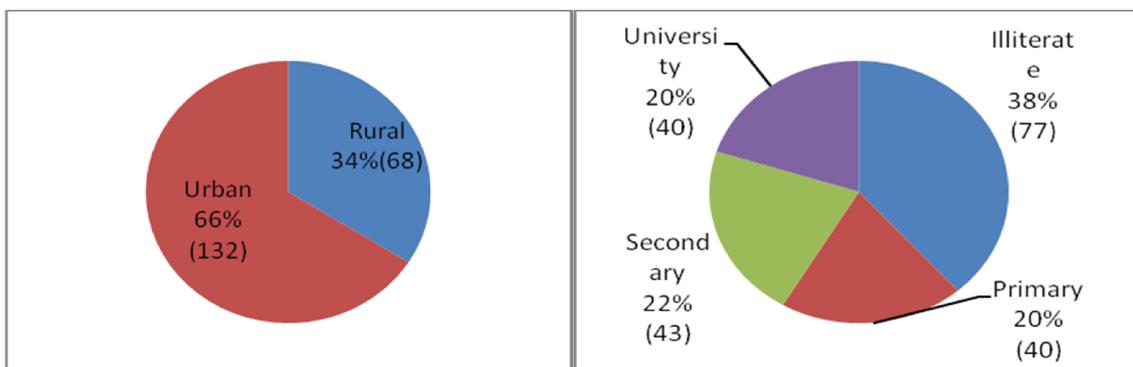
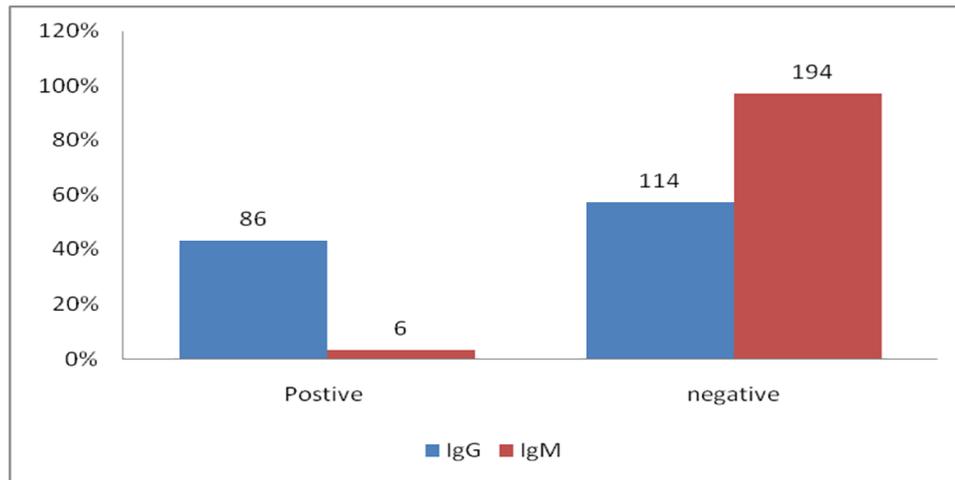


Fig. 2. The educational and residency status of 200 females tested for toxoplasmosis antibodies in Sana'a city, Yemen.

The seropositive for anti-Toxoplasma gondii IgG and IgM(Table3). For IgG was 86(43%), the result was significant  $\chi^2=3.92$ ,  $PV=0.04771$  and for anti T.gondii IgM was 6 (3%),  $\chi^2=176.72$ ,  $PV<2.2.10^{-6}$  so the result was highly significant.

**Table 3. The Seroprevalence rate of IgG and IgM against toxoplasmosis by ELeccys test among 200 female tested for toxoplasmosis antibodies in Sana'a city, Yemen**

Antibody type	Number of females tested	Positive		Negative	
		No.	%	No.	%
IgG	200	86	43	114	57
IgM	200	6	3	194	97



**Fig. 3. The Seroprevalence rate of IgG and IgM against toxoplasmosis by ELeccys test among 200 female tested for toxoplasmosis antibodies in Sana'a city, Yemen**

The distribution of positive serum samples among the different age groups for IgG shows (Table 4). The women of the age group  $\geq 40$  had the highest percentage 60%, the result of this relation was not significant  $\chi^2=10$ ,  $PV=0.07524$ .

**Table 4. The age distribution of 200 females tested for anti T.gondii IgG in Sana'a city, Yemen.**

Age group(years)	Number	IgG	
		No. Positive (%)	No. Negative (%)
15-19	16	4 (25)	12 (75)
20-24	42	14 (33.3)	28 (66.7)
25-29	50	19 (38)	31 (62)
30-34	37	17 (45.9)	20 (54.1)
35-39	30	17 (56.7)	13 (43.3)
$\geq 40$	25	15 (60)	10 (40)

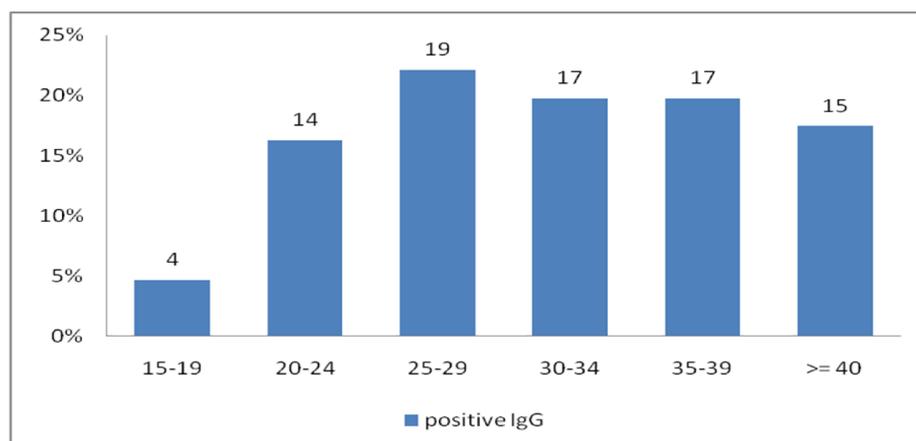


Fig. 4. The age distribution of 200 females tested for anti T.gondii IgG in Sana'a city, Yemen

Depending on previous tables, were excluded negative samples, continue to study and analysis positive samples, and focused on three risk determinants: age group, education, residency, history of abortion as illustrated in the following tables.

The educational and residency status of females for Toxoplasmosis antibodies (Table5).

Concerning the educational statuses highest rate of seropositive IgG were occurred in illiteracy women (44.19%),  $X^2=18$ ,  $PV=0.0004398$  so the relation between levels of education was significant.

Concerning the residency statuses, the highest percent was in urban 74.42% While 25.58% was in rural and this result also was significant  $X^2=20.5116$ ,  $PV=5.927.10^{-6}$

Table 5. The seroprevalance of IgG antibodies agnist toxoplasmosis and relative risk education and residency.

Characters		Positive IgG	
		No.	(%)
Education	Illiterate	38	(44.19)
	Primary	14	(16.28)
	Secondary	20	(23.25)
	University	14	(16.28)
Residency	Rural	22	(25.58)
	Urban	64	(74.42)

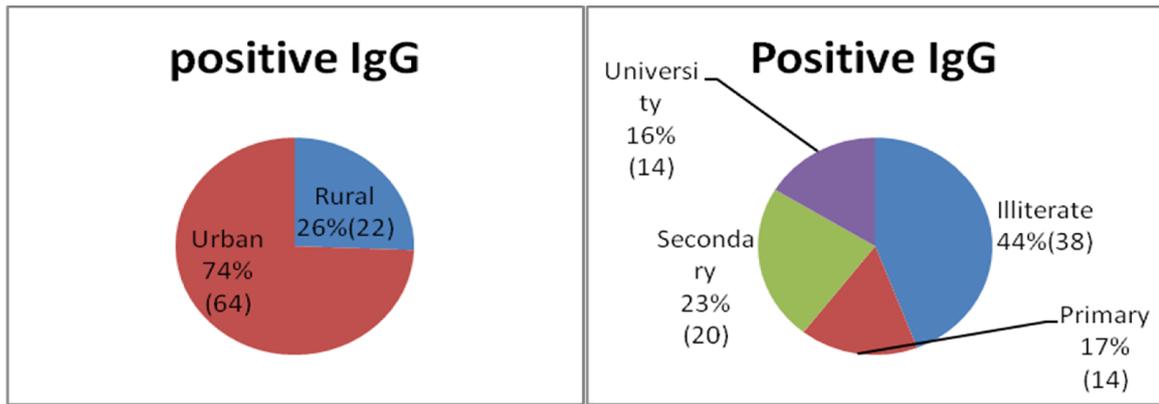


Fig. 5. The Seroprevalence of IgG antibodies agnist toxoplasmosis and relative risk education and residency.

The relation between IgG antibodies positive for toxoplasmosis and history of abortion shows (Table 6). The prevalence rate of IgG with females who had abortion 48.84%, while the prevalence rate of IgG with females who hadn't abortion 51.16%. This result was not significant  $X^2=0.0465$ ,  $PV=0.8292$ .

Table 6. The relation between IgG antibodies positive for toxoplasmosis and history of abortion among positive females in Sana'a city, Yemen.

History of Abortion	Positive IgG	
	No.	(%)
Abortion	42	(48.84)
No Abortion	44	(51.16)

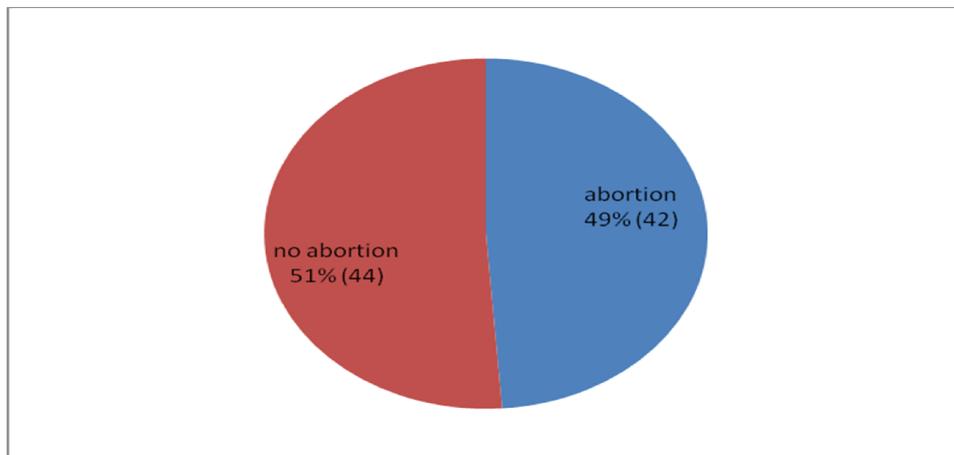


Fig. 6. The relation between IgG antibodies positive for toxoplasmosis and history of abortion among positive females in Sana'a city, Yemen

The potential risk factors of contracting toxoplasmosis among females in Sana'a city (Table 5). Shows no risk for contracting toxoplasmosis and animal contact in which  $X^2=0.186$ ,  $PV=0.28$ .

For contracting toxoplasmosis and Consuming, uncooked meat there was significant result in which  $X^2=26.7907$ ,  $PV=2.267.10^{-6}$  and there was significant result for contracting toxoplasmosis with Consuming raw vegetable  $X^2=16.7907$ ,  $PV=4.174.10^{-6}$ .

Table7. The potential risk factors of contracting toxoplasmosis among females, Sana'a city Yemen

Characters	Positive IgG n=86	
	No	%
Animal contact	45	46.9
Consuming uncooked	19	38.8
Consuming raw vegetable	24	50

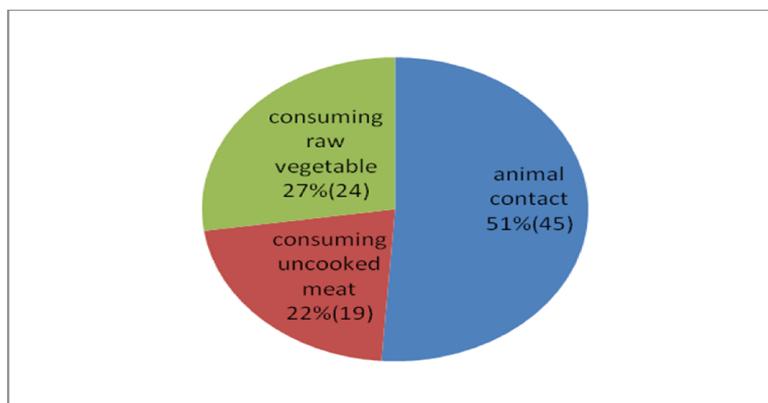


Fig.7. the potential risk factors of contracting toxoplasmosis among females, Sana'a city Yemen

#### 4 DISCUSSION AND CONCLUSION

The high incidence of Toxoplasmosis infection in Yemen and the not clear epidemiological picture lead to opened the debate concerning the appropriateness of determine toxoplasmosis problem in female at age bearing time which usually lead to defect in fetus. For this reason prevent of congenital defects of toxoplasmosis originally depend on understanding the epidemiology of toxoplasmosis among this group of females appeared as a good option for prevention toxoplasmosis related complications in fetus or on mother [10]. This study was conducted aiming to understanding the prevalence and epidemiology of toxoplasmosis among female at age bearing time in Yemen to find preventive measures can be suitable for Yemen to prevent congenital defect due to toxoplasmosis.

A study of 200 female at age bearing time, resident in Sana'a city Yemen, revealed that the IgG Seroprevalence according to Elecsys was 43%, and that of IgM was 3%. The recent active of toxoplasmosis infection, estimated on the basis of IgM was 3%. These results confirm a high rate of toxoplasmosis in the prevalence of IgG that indicate protected antibodies level, but also indicate a only 3% of recent active infection and possibility for 57% of pregnant women to infect during pregnancy, thus suggesting that screening for anti-Toxoplasma antibodies during pregnancy should be maintained.

In addition, the 43% of Toxoplasma IgG antibodies that detected among females at age bearing time a may have been due to either past infection (apparently sub-clinical), current active subclinical disease or exposure to the parasite without active disease.

The Seroprevalence of pregnant toxoplasmosis were reported in many countries as reaching 80% to 90% in northern Europe (United Kingdom, Norway, Sweden), 20% in Brazil, 50% in France, [11], 42% in Italy [12], in Iran (57%) [13], 58.2% in Kuwait [14]. This Seroprevalence of IgG antibody in our study (43%) which was in near to some other value previously reported in Saudi Arabia (43.4%) [15], 44% in Somalia [16], and 47.1% in Jordan [17].

The high prevalence in these countries is probably due to a high consumption of raw and lightly cooked meat [18]. On the other hand, our high rate is related mostly to the high rate of environment contamination as it seen in the tropic due to low level or absent hygiene standards for personal and for environment. In the population tested, 3% of the females were positive for Toxoplasma IgM antibody. The Seroprevalence of IgM antibody in these females is due to current active disease. This infection with toxoplasmosis in most immunocompetent females, the infection enters a latent phase, during which only bradyzoites are present, forming cysts in nervous and muscle tissue [19], it may be exhibits a wide range of clinical manifestation from asymptomatic infection to clinical symptomatic disease including fever, lymphadenopathy, etc[20]. This infection might be increased risk for the fetus if the female pregnant to abortion or fetus infection that lead to congenital deformity of newborn [21].

The infections transmission among study group might be through direct contact with animal sources [22] or through ingestion contaminated food with infective stage (Sporozoites) [23]. This study showed there was association between the risk of contracting toxoplasmosis infection (IgG positive) and residency in urban areas. This result similar to that reported by Baril [24] and it is different from result that reported in Greece where high risk of contracting toxoplasmosis was occurred with residency in rural areas than urban areas [22].

## 5 CONCLUSION

This study revealed a high Seroprevalence of *T. gondii* antibodies among Yemeni married women in Sana'a city so one of every two women at risk, toxoplasmosis rate was high among women illiterate more than women educated so health education for female's community is very important to prevent infection in future. At the same time the infection, showed increasing in urban area, Controlling and monitoring should be implement to reduce the risk of toxoplasmosis. Further epidemiological study to determine the prevalence of *T. gondii* in all cities in Yemen is necessary.

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