



Original Research Article

Sero Prevalence of Toxoplasmosis in Pregnant Women in Taiz-Yemen

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A B S T R A C T

Keywords

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Abortion;
Animal contact.

Toxoplasmosis (T) is a zoonotic disease worldwide. This is a cross section study involved 134 pregnant women attended the obstetric clinic of Al- Forqan Charity Center in Taiz governorate from April 1st, to July 30th, 2011, with an overall aim to study Toxoplasma seroprevalence among pregnant women in Taiz governorate-Yemen. The numbers of positive Toxoplasma Serology was 59 cases (44%), and the percentage of negative cases serology was 56%. It was 39.5% for IgG, 1.5% for IgM and 3.5% for IgG and IgM together. In seropositivity pregnant Women (59 cases) the percentage of seropositivity is increasing with advancement of pregnancy (it was 23.7% in the first trimester increasing to 45.8% in the third trimester). About 59.3% were pluripara, 30.5% were multipara and only 1.7% was Nullipara, 56 cases out of 59 positive serological cases (94.9%) had previous abortion, 27 cases out of 59 positive serological cases (45.8) had history of animal contact, and the remaining of positive cases (32) had no history of animal contact. There is no significant statistical relationship between seropositivity and maternal parity or gestational age ($P>0.05$), but it was significant statistical relationship with previous abortions ($P<0.05$). This study concluded that in Taiz-Yemen there is a significant percentage of toxoplasma seropositivity among pregnant women and recommended a wide educational program for the whole population in Yemen illustrating the hygienic conditions in dealing with animals and we recommended more studies among pregnant women that had previous abortions.

Introduction

Definition: Toxoplasmosis /tox-o-plas-mo-sis/ (-plaz-mo'sis) is an acute or chronic, widespread infectious disease of animals and humans caused by *Toxoplasma gondii* (unicellular protozoan parasite) and

transmitted by oocysts in the feces of cats [1,2]. The definitive host of *T. gondii* is the cat, but the parasite can be carried by many warm-blooded animals, birds or mammals including human [2]. Most human

infections are asymptomatic (most individuals do not experience any symptoms); when symptoms occur, they range from a mild, self-limited disease to a disseminated, fulminating disease that may damage the brain, eyes, muscles, liver, and lungs. Moreover, it may be a fatal disease, in individuals with weakened immune systems and in fetuses infected transplacentally as a result of maternal infection [3]. Serological surveys indicate that 3-70% of healthy adults in the United States of America have been infected with *T. gondii*. The infection affects more than 3500 newborns in the United States each year.

T. gondii seropositivity rates among patients with HIV infection vary from 10-45% [4, 5]. Cultural habits of a population may affect the acquisition of *T. gondii* infection from ingested tissue cysts in undercooked or uncooked meat [5]. Based on serological studies, recent estimates suggest 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 [6, 7]. The incidence of prenatal *T. gondii* infection within the same or similar populations have been estimated to range from about 1 to 120 per 10,000 births [5]. Infection has been detected in up to 1% of women during pregnancy. About 15 to 60% of such infections are transmitted to the fetus, but only a small percentage result in abortion or stillbirths or in active disease. Fetal infection is more severe early in pregnancy [11, 12].

Materials and Methods

Study design

This is a cross sectional study, involved randomly selected pregnant women attending the obstetric clinic of Al-Forqan Charity Center in Taiz governorate for 4

months (from April 1st, to July 30th, 2011).

Study population

The study population was 134 pregnant women attended the obstetric clinic during the study period. Pregnant women were randomly selected from the obstetric clinic by using the simple random sampling, each day they were taken by the order of the randomly selected numbers, i.e. when the random number selected is 4, we selected pregnant women number 4,8,12,16,...etc.

Study area

This study is conducted Al-Forqan Charity Center in Taiz, where an obstetric clinic is present with a load of pregnant women attending for prenatal care. The laboratory tests were performed in the lab. of the same center.

Data collection

The method of data collection in this study was direct method:

- a. A questionnaire was designed for data collection, which included all the required variables for analysis.
- b. Data of abortion, parity, gestational age of pregnant women and animal contact were taken directly from pregnant women themselves.
- c. Blood samples were examined by the Technicians in the lab of the center, and the results were reported in the same questionnaire of pregnant women.

Data processing and analysis

Data processing was performed by the statistical program (SPSS 16), all the studied variables were qualitative variables. They were presented as frequencies and percentages and tested by the Chi-square test

or Fisher exact test as appropriate. Results of serology were classified as seropositivity when they showed positive reaction with IgG or IgM, and seronegatively when they showed negative reaction for both. After calculation of the frequency of seropositivity among pregnant women, the results of serology were related to the other studied variables. All tests were applied at the 95% confidence limits with a level of significance ($\alpha=0.05$). P-values of < 0.05 were considered as statistically significant.

Ethical considerations

Following the ethical principles applied to every step of scientific research involving human being, an informed verbal consent from all pregnant women, who were involved in this study, was obtained after providing them detailed explanation of the objective of the study. Patients were also assured that the obtainable information would be confidentially handled and used only for research purposes.

Laboratory methods

Toxoplasmosis Test Kit Latex Agglutination [15- 16]. ProDia International: MA_Toxo.

Interpretation of results

A negative reaction indicates the absence of Toxoplasma antibodies. A clear positive reaction indicates the presence of Toxoplasma antibodies which reflects either a past infection or an evolving infection. In these cases the final titer should be determined. BioCheck Toxoplasma IgG Enzyme Immunoassay [17, 18].

Calculation of results

- a. We calculated the mean of duplicate cut-off (32 IU/ml) calibrator value XC.

- b. We calculated the mean of duplicate positive control (xp), negative control (xn) and patient samples (Xs).
- c. We Calculated the Toxoplasma IgG Index of each determination by dividing the mean values of each sample by calibrator mean value, XC.

Quantitative estimation of Toxoplasma IgG

For a quantitative determination of anti-Toxoplasma IgG levels of positive specimens in IU/ml, OD of cut-off and positive calibrators are plotted on Y-axis in graph versus their corresponding anti-Toxoplasma IgG concentration of 0, 32, 100, and 300 IU/ml on X-axis. The Toxo IgG levels in patient sera are read off the graph using their individual OD values.

Interpretation

- a. Negative: Toxo G Index less than 0.90 indicate absence of prior exposure to Toxoplasma (< 32 IU/ml).
- b. Equivocal: Toxo G Index between 0.91-0.99 is equivocal. Sample should be retested.
- c. Positive: Toxo G Index of 1.00 or greater, or WHO IU/ml, value greater than 32 IU/ml is seropositive. It indicates prior exposure to the Toxoplasma virus.

If current infection is suspected, a second sample obtained 8-14 days later should be tested for IgG antibody simultaneously. Toxo G Index ratio between paired samples greater than 1.5 is highly suggestive of a significant rise in antibody. It may be considered as indicative of acute Toxoplasma infection. Enzyme

Immunoassay for the detection of IgM antibodies to *Toxoplasma Gondii* in human serum BioCheck *Toxoplasma* IgM Enzyme Immunoassay [17, 18].

Results and Discussion

The present was investigated 134 pregnant women which were selected randomly with different gestational age during their attendance for antenatal care in the obstetric clinic. During data analysis it was found that 53 pregnant women (39.5%) were having positive IgG, 2 pregnant women (1.5%) with positive IgM and 4 pregnant women with positive IgG and IgM (3.0%) [Fig.1]. The frequency of positive *Toxoplasma* serology was 44% (59 women from the total 134 pregnant women) [Fig.2]. When the studied women were classified according to their gestational age, it was found that 29.1% were in the first trimester of pregnancy, 33.6% were in the second trimester and 37.3% were in the third trimester [Table 1].

From those pregnant women with positive *Toxoplasma* serology; the percentage is increasing with advancement of pregnancy; it was 23.7% in the first trimester increasing to 45.8% in the third trimester. Statistically, there is no significant relationship between gestational age and *Toxoplasma* serology ($P>0.05$). [Table 1]. Most of the studied women were pluripara, i.e. having 1-3 deliveries (62.7%), from those women with positive serology; 59.3% were pluripara and 30.5% were multipara, only 1.7% was Nullipara i.e. not delivered yet. Statistically, there is no significant relationship between parity and *Toxoplasma* serology ($P>0.05$) [Table 2]. About 53.7% of pregnant women reported previous abortion. Previous abortions showed significant statistical association with *Toxoplasma* serology ($P<0.05$), in those with positive *Toxoplasma*

serology 94.9% reported previous abortion and 5.1% did not report previous abortions [Table 3]. In regard to the number of previous abortions, it did not show significant relationship to the result of *Toxoplasma* serology ($P>0.05$), most of pregnant women were having once or twice previous abortion regardless to the result of *Toxoplasma* serology [Table 4]. When the type of positive *Toxoplasma* antibody was related to previous abortion, there is no significant difference between those with or without previous abortion ($P>0.05$). It was observed that 51 out of 53 pregnant women with positive IgG reported previous abortion [Fig. 3].

44% of the studied women reported animal contact; however, more than half of pregnant women with positive or negative *Toxoplasma* serology did not report animal contact [Table 5]. When the type of positive *Toxoplasma* antibody was related to animal contact, there is no significant difference between those with or without animal contact ($P>0.05$). It was observed that 30 out of 53 pregnant women with positive IgG reported no animal contact [Fig. 4]. In those with animal contact and positive *Toxoplasma* serology; 77.8% reported contact with cats alone, 7.4% with goats and 7.4% with mice [Table 6]. The number of seronegatively pregnant women with cats contact was higher than that of seropositivity pregnant women with cats contact (31 vs. 22 women) respectively [Fig. 5].

Infection by the protozoan *T.Gondii* is one of the most common parasitic infections of animals and man. The results of this study, based on serological tests, confirmed the expectation that toxoplasmosis is indeed endemic in Taiz and that a substantial proportion of the pregnant women showed evidence of earlier infection (IgG).

Figure.1 Results of serological Abs testing for toxoplasmosis in the studied pregnant women

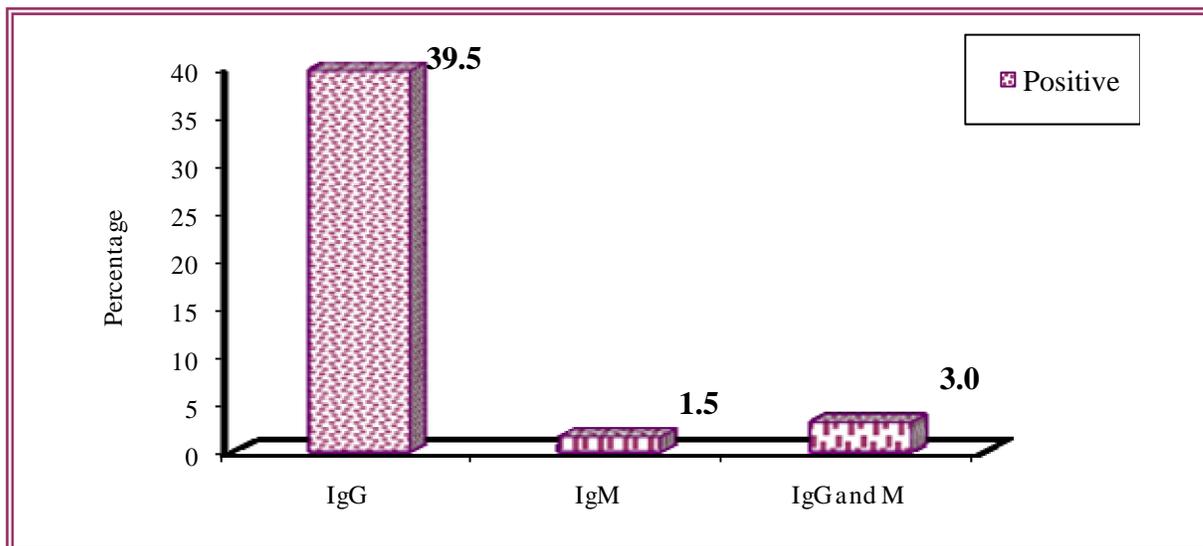


Figure.2 Frequency of positive Toxoplasma serology in the studied pregnant women in Taiz

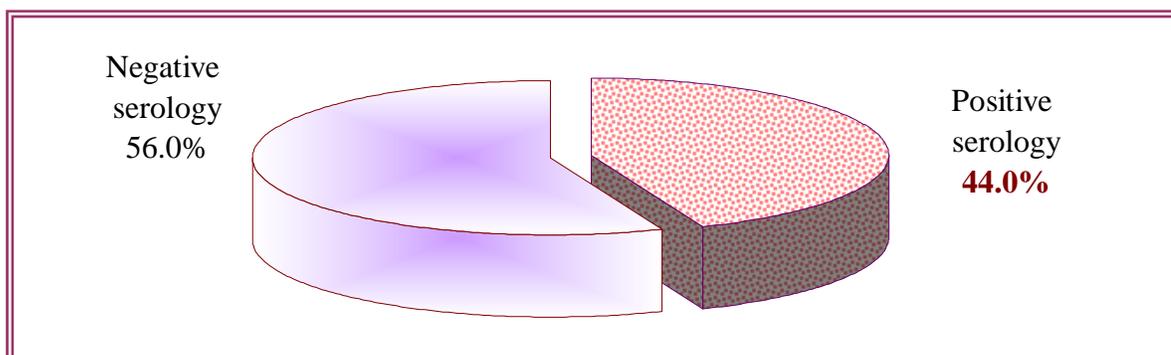


Table.1 Toxoplasma seroprevalence of pregnant women according to gestational age

Gestational age	Toxoplasma serology				Total (n=134)	
	Positive (n=59)		Negative (n=75)			
	N _o	%	N _o	%	N _o	%
First trimester	14	23.7	25	33.3	39	29.1
Second trimester	18	30.5	27	36.0	45	33.6
Third trimester	27	45.8	23	30.7	50	37.3
Chi square test [$\chi^2 = 3.36, p= 0.18$] is statistically insignificant						

Table.2 Toxoplasma seroprevalence of pregnant women according to maternal parity

Maternal parity	Toxoplasma serology				Total (n=134)	
	Positive (n=59)		Negative (n=75)			
	N ₀	%	N ₀	%	N ₀	%
Nullipara (0)	1	1.7	8	10.7	9	6.7
Pluripara (1-3)	35	59.3	49	65.3	84	62.7
Multipara (4-5)	18	30.5	13	17.3	31	23.1
Grandmultipara (>5)	5	8.5	5	6.7	10	7.5
Chi square test [$\chi^2 = 6.77, p=0.07$] is statistically insignificant						

Table.3 Toxoplasma seroprevalence of pregnant women according to abortion

Previous abortions	Toxoplasma serology				Total (n=134)	
	Positive (n=59)		Negative (n=75)			
	N ₀	%	N ₀	%	N ₀	%
Yes	56	94.9	16	21.3	72	53.7
No	3	5.1	59	78.7	62	46.3
Fisher exact test [p=0.0000000] is statistically significant						

Table.4 Toxoplasma seroprevalence of pregnant women according to frequency of previous abortion

Frequency of previous abortion	Toxoplasma serology				Total (n=72)	
	Positive (n=56)		Negative (n=16)			
	N ₀	%	N ₀	%	N ₀	%
1	33	58.9	12	75.0	45	62.5
2	14	25.0	3	18.8	17	23.6
3	8	14.3	1	6.3	9	12.5
4	1	1.8	0	0.0	1	1.4
Chi square test [$\chi^2 = 1.65, P= 0.064$] is statistically insignificant						

Table.5 Toxoplasma seroprevalence of pregnant women according to animal contact

Animal contact	Toxoplasma serology				Total (n=134)	
	Positive (n=59)		Negative (n=75)			
	N ₀	%	N ₀	%	N ₀	%
Yes	27	45.8	32	42.7	59	44.0
No	32	54.2	43	57.3	75	56.0
Chi square test [$\chi^2 = 0.13, P= 0.72$] is statistically insignificant						

Figure.3 History of abortion in pregnant women with positive Toxoplasma serology

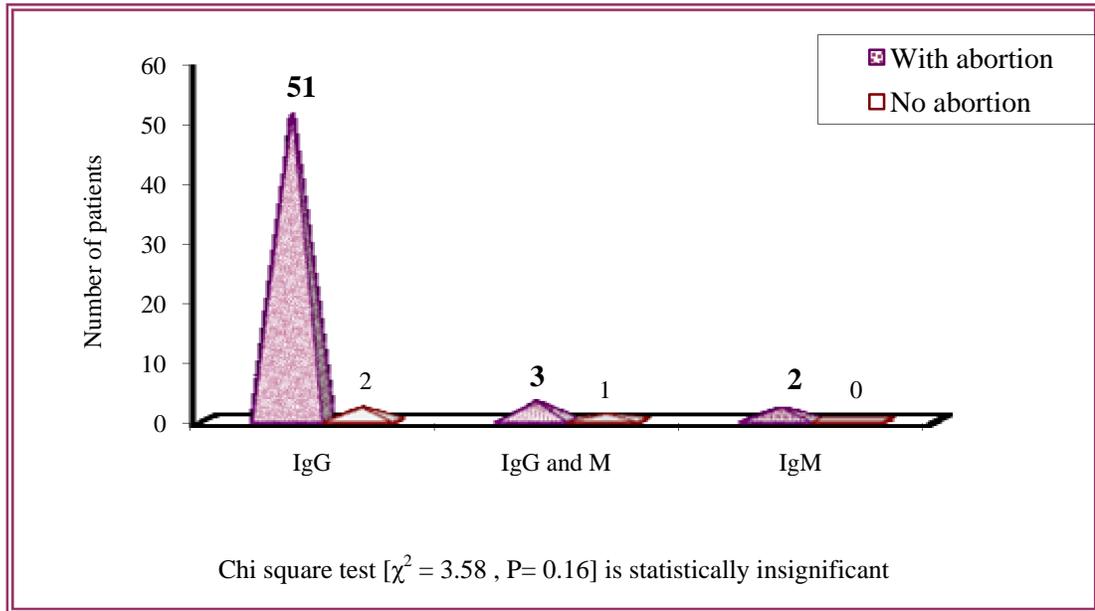


Figure.4 History of animal contact in pregnant women with positive Toxoplasma serology

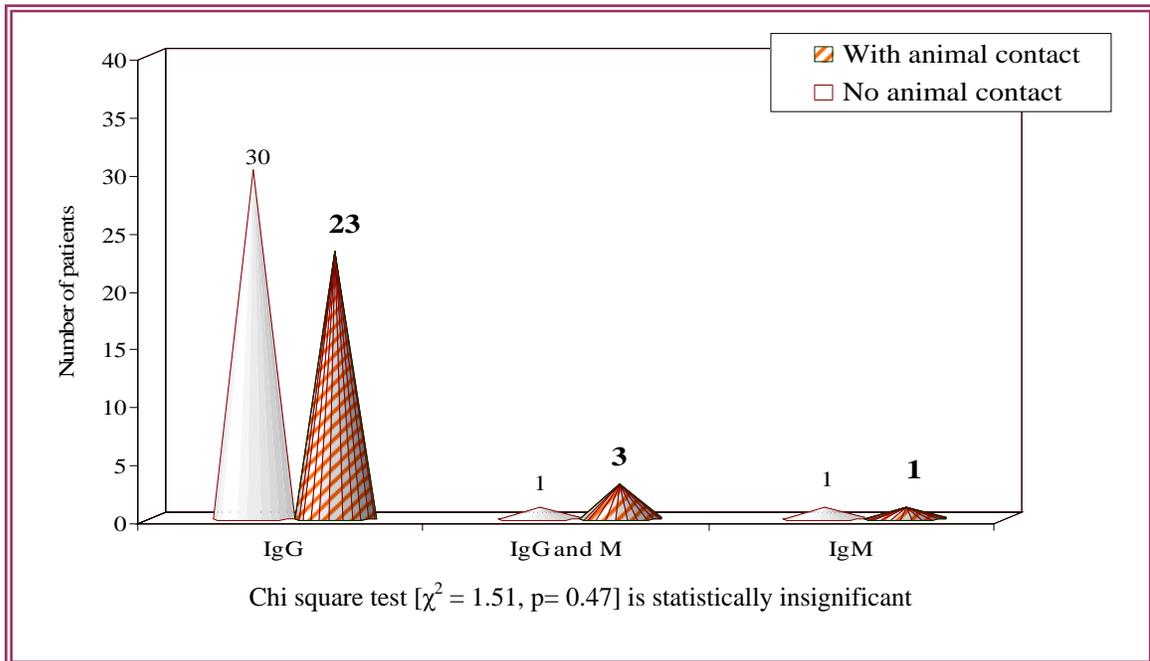
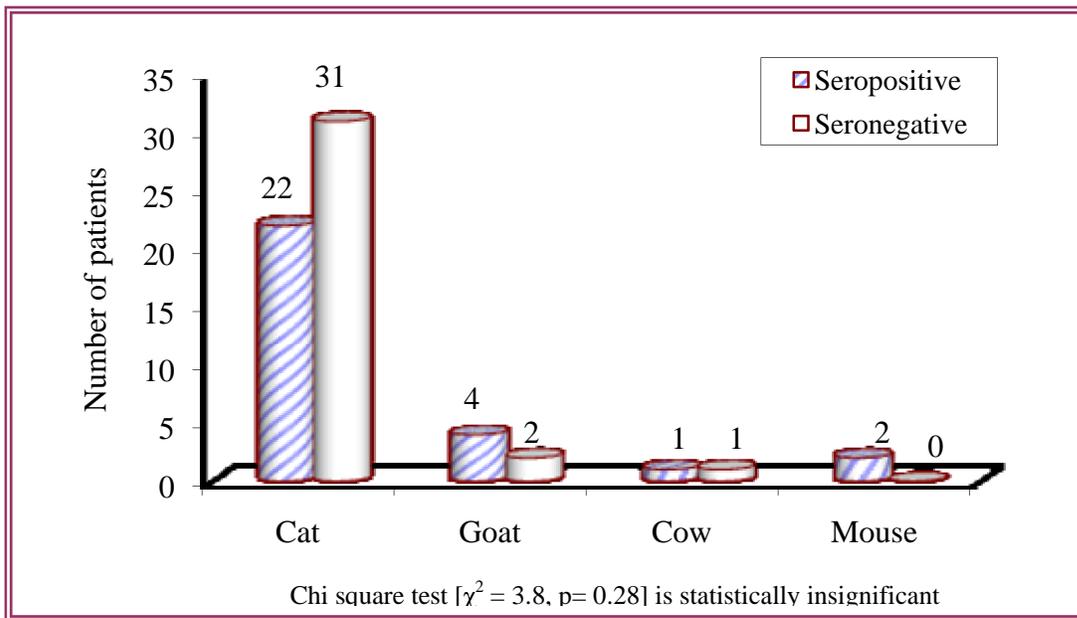


Table.6 Toxoplasma seroprevalence of pregnant women according to the type of animal in contact with the patient

Type of animals	Toxoplasma serology				Total (n=59)	
	Positive (n=27)		Negative (n=32)			
	N _o	%	N _o	%	N _o	%
Cat	21	77.8	30	93.8	51	86.4
Goat	2	7.4	1	3.1	3	5.1
Mouse	2	7.4	0	0.0	2	3.4
Cat and goat	1	3.7	0	0.0	1	1.7
Cow and goat	1	3.7	0	0.0	1	1.7
Cow, goat and cat	0	0.0	1	3.1	1	1.7
Chi square test [$\chi^2 = 6.54, P= 0.25$] is statistically insignificant						

Figure.5 Number of animals in contact with pregnant women who are seropositive and seronegatively



Of 350 pregnant women, 108(30.9%) were seropositivity IgG for *Toxoplasma gondii* –specific antibody,the seroprevalence rate of *Toxoplasma gondii* specific antibody was higher among pregnant women from the urban than rural(41.5% versus

22%)P=0.001[29]. The frequency of positive Toxoplasma serology among pregnant omen in Taiz was 44%. It is similar to that reported among pregnant women in Elam Province, Iran (44.8%).[19] other countries with near

prevalence to our study include Turkey (30.1%) and Jordan (31.7%) [10]. This prevalence is variable according to different geographic areas. It was as low as in Thailand, it was reported among 13.2% of pregnant women, 20 and Al-Doha - Qatar (29.8%) [21], and as high as in Korea (79%), [8] and Tehran (84%) [22]. In Kinshasa (Congo), toxoplasmosis endemicity is highly prevalent. One woman out of 25 had a recent toxoplasmosis infection and 20% not protected against primo-infections [28]. This study found that there is no significant relationship between *Toxoplasma* seropositivity pregnant women and gestational age or parity of the studied women.

Toxoplasma infection act as a teratogenic factor for intrauterine fetus in the early weeks of gestation and thus induced spontaneous abortion in most of the cases. Our study found that previous abortion showed significant statistical association with *Toxoplasma* serology ($P < 0.05$), about 94.9% of pregnant women with positive *Toxoplasma* serology reported previous abortion and 5.1% did not report previous abortion. This is similar to that proved in different studies such as that of a recent study from Chandigarh (India) which reports rising seropositivity to *Toxoplasma* in women with previous abortion [23]. Toxoplasmosis is a zoonotic arising from man's close contact with domestic cats (*Felis cats*) [24,25]. Both domestic and wild felids are the only known definitive hosts of *T. gondii* in which the sexual cycle can take place, [26] and hence cats play a central role in the epidemiology of *T. gondii*, constituting the only known source of environmental contamination with the infective oocysts stage. A high risk is thus imposed on human communities that come into contact with cats [27]. In this study, 44% of pregnant

women reported a history of animal contact; however, more than half of the pregnant women with positive or negative *Toxoplasma* serology did not report animal contact. Animal contact is one of the risk factors for transmission of Toxoplasmosis, however, it is not necessary to have a direct contact with such animals, and most of the cases are infected through contact with oocysts transmitted by the cats themselves during their movement to other places or by flies to our hands and food. It is not necessary to have a clear cut contact to animals during diagnosis of *Toxoplasma* infection although in this study we found that 77.8% of *Toxoplasma* seropositive pregnant women with history of contact with cats alone. The presence of abundant cats in Taiz will further increase the prevalence of seropositivity women for Toxoplasmosis. Cats are reared in different houses in Taiz and present in every restaurant or side-road. This is an essential step in controlling the further transmission of Toxoplasmosis to our women.

Recommendation

This study recommends the followings: Wide educational program is needed for the whole population in Yemen illustrating the hygienic conditions in dealing with animals and the preventive methods for diseases transmitted by animals.

1. Similar studies are recommended in different governorates in Yemen as a national based study to clarify the exact prevalence of Toxoplasmosis during pregnancy in Yemen.
2. Studied of the causes of Abortions in pregnant women may correct the problem of toxoplasmosis in pregnant women.

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