



INVESTIGATING THE PREVALENCE OF INFECTION WITH *TOXOPLASMA GONDII* IN MEN AND WOMEN IN SAMARRA CITY, IRAQ

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Abstract

The present study included 50 men and 50 women aged 18-45 years. Acute and chronic infection was detected by ELISA-IgM and ELISA-IgG. Blood samples were collected and the relevant information (age, gender, area of residence, educational level, job, presence of cats and with the number of miscarriages) was recorded about the study groups by using a questionnaire comparing the infection with *T. gondii* between men and women. The results of ELISA-IgM and ELISA-IgG test showed that the highest rate of acute (12%) and chronic (74%) infections in men, while in women was 14% and 66%, respectively. The present study showed the highest rate of acute infection in men (16.6%) and women (27.3%) was in the age group 32 - 38 years, the highest rate of chronic infection for men (78.6%) in the age group 18 - 24 years and women (81.8%) in age group 32 - 38 years. The present results revealed that there was a lack of differences between the urban and rural areas with parasitic infection, whereas the highest percentage of acute infection was in men and women live in urban (14.3%) and the rural (18.5%) areas, while the highest rate of chronic infection in men was 74.3% and women was 73.9% live in the urban area. The current results showed that the highest rate of acute infection was in uneducated men (14.3%) and women (50.0%), while the highest rate of chronic infection was in men and women with intermediate school stage (85.7% and 87.5%), respectively. The present results indicated that the highest rate of prevalence of acute infection with toxoplasmosis according to work was in employed men (12.5%) and non-employed women (16.2%), while the highest rate of chronic infection prevalence in employed men was 85.3% and women 70.3%. As for the presence of cats, the current results showed the highest incidence of acute infection in men and women who were breeders of cats at home (33.3% and 44.4%) respectively, while the highest rate of chronic infection was in men (77.3%) and women (70.7%), who indicated to their homes were almost don't free of stray cats. The present results showed a significant increasing in the total number average of leukocytes at the acute stage of infection for men (11866±2508 cells/mm³ blood) and women (10300±2504 cells/mm³ blood), then the average non-significant decreasing at the chronic stage of the infection for men (9068±1975 cells/mm³ blood) and women (8623±1810 cells/mm³ blood), compared with the control group (7280±1148 cells/mm³ blood and 10300±2504 cells/mm³ blood), respectively. The present results showed the percentage of miscarriages according to the number of aborted women under study in Samarra. The percentage of total number of aborted women was 76.7%, for abortion twice (100%), for three times (70%) and either the percentage of miscarriages more than three times was 100% for acute infection only.

Key words : *Toxoplasma gondii*, prevalence, IgM, IgG.

Introduction

Toxoplasmosis, is a zoonotic disease caused by *Toxoplasma gondii* an intracellular parasite. The parasite was first discovered in Iraq in 1938 by Machattie in histological sections prepared from the spleen and lungs of stray dogs in Baghdad (Taila *et al.*, 2011). The life cycle is complex, it requires two types of hosts, the final host is manifested by Felidae (feline family) especially cats, an intermediate host that include a large number of

fixed-temperature animals as humans and other species of mammals and birds (Dubey, 2003). The infection is a symptoms in immunocompetent host (Bessieres *et al.*, 1999). The host's immune system enables to stop parasite multiplication and tissue cysts formation of parasite in most tissues of the body, this tissue cysts are highly concentrated in the central nervous system as well as in skeletal and cardiac muscles without symptoms in most cases (Miller *et al.*, 1999). The real risk of infection with

toxoplasmosis is shown in people with immunodeficiency or immunosuppressive diseases and in pregnant women, where mother-to-child transmission can lead to abortions or congenital malformations in the fetus (Villena *et al.*, 2010). *Toxoplasma gondii* is characterized by three different stages, each of which has capability for infection events for human and farm animals. These stages include the tachyzoites and bradyzoites (contained within the tissue cysts) and oocysts (Dubey, 1998b; 1998b).

A study was performed to investigate some immunological parameters of woman's sera infected with toxoplasmosis and also to identify the prevalence rate of infection with *T. gondii* in Baghdad city and its relation with age and habitual abortion occurrence (Kadhim, 2006). A study was carried out in Baghdad city too, to primary maternal infection with toxoplasmosis during gestation and its transmission to the fetus continue to be the cause of tragic yet preventable disease in offspring. Serological test (ELISA) and nested polymerase chain reaction were used in an attempt to diagnose toxoplasmosis in the blood of abortive and pregnant women (Al-Rawi, 2009). A study was performed to diagnosis of the parasite by isolation it from placenta and curettage of uterus of aborted women who were attending Tikrit Teaching Hospital (Ahmed, 2008). Al-Nasiry (2013) studied of investigate the rate of infection with toxoplasmosis among aborted and normally delivered women and livestock (sheep and goats) in Salah Al-deen governorate and Al-anbar.

Objectives

The aim of the present study is to compare the infection with *T. gondii* between men and women and focusing light on the infection of men in the region and determining the relationship between infection and age, educational level and job, as well as study the effect of the resident site and presence of cats to infection events and study the effect of the infection on repeated miscarriage in women.

Materials and Methods

The present study was carried out from August, 2016 to March, 2017. 100 blood samples were collected from the laboratories of Samarra General Hospital and primary health care centers.

The relevant information (age, gender, area of residence, educational level, job, presence of cats and times number of miscarriages) was recorded about the study groups by using a questionnaire for each person.

Blood samples collect

Venous blood sample (7ml) was collected from each

individual and it was divided into two tubes: plain tube (first tube) was contained 4ml of blood that left for 30 minutes at room temperature for clotting. After that, each sample was centrifuged at 2000 rpm for 10 minutes, then the serum collected by micropipette and conserved in a sterile test tube at -20°C until used in the ELISA test. Anticoagulant tube (second tube) was used the remaining blood (3 ml) for the total and differential account of white blood cells.

Toxoplasma IgM enzyme immunoassay test kit

The IgM antibody was detected in the serum of infected patients with *T. gondii* by using commercial kit, equipment from American BioCheck, Inc. (Catalog No. BC-1087).

Toxoplasma IgG enzyme immunoassay test kit

The IgG antibody test was detected in the serum of infected patients with *T. gondii* by using commercial kit, equipment from the German bioactiva diagnostica (Catalog No. TOXG01).

Statistical analysis

The most present results were statistically analyzed by using the Chi-square (χ^2) test and others by Duncan's multiple range test, the means of the groups were measured with $P \leq 0.05$ and by using Minitab program (Elsahookie and Waheeb, 1990).

Results and Discussion

Table 1 showed that the highest rate of acute infection in men and women in the group aged between 32-38 years was 16.6% and 27.3% respectively, while the highest rate of chronic infection in men was 78.6% in the group aged between 18-24 years and in women was 81.8% in the group aged between 32–38 years.

The results of the statistical analysis (table 1) by using the Chi-square (χ^2) test showed non-significant differences. The present results agreed with the results of Al-Shua'aibi, (2012), which pointed to the highest percentage (41.17%) of the infection in the age group (20-25) for each men and women, the two previous age groups are the most common age group in our society and most Arab countries in which marriages occur and therefore frequent visits to health clinics and hospitals to determine health status for women and their husbands (Kadhim, 2006) and the present results were agreed with the results of AL-Essawi (2012) that indicated to the highest rate of acute infection in the age groups (16-25 years) and (26-35 years) is a percentages 13.64% and 12.82% respectively, but didn't agree with regard to the chronic infection, where he pointed to the highest rate

Table 1 : Distribution of infection with *T. gondii* according to age for men & women.

Age (year)	Acute infection				Chronic infection				Total infected No.(%)
	Men		Women		Men		Women		
	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	
18-24	14	1(7.1)	15	3(20)	14	11(78.6)	15	7(46.7)	22
25-31	11	1(9.1)	10	0	11	8(72.7)	10	8(80)	17
32-38	18	3(16.6)	11	3(27.3)	18	14(77.8)	11	9(81.8)	29
39-45	7	1(14.2)	14	1(7.1)	7	4(57.1)	14	9(64.3)	15
Total	50	6(12)	50	7(14)	50	37(74)	50	33(66)	83
Calculated value = 1.935				df= 3	Calculated value = 1.596				df= 3
Table value = 7.814					Table value = 7.814				

Table 2 : Distribution of infections with *T. gondii* according to live site for men & women.

Live site	Acute infection				Chronic infection				Total infected No.(%)
	Men		Women		Men		Women		
	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	
Urban	35	5(14.3)	23	2(8.7)	35	26(74.3)	23	17(73.9)	50
Rural	15	1(6.7)	27	5(18.5)	15	11(73.3)	27	16(59.3)	33
Total	50	6(12)	50	7(14)	50	37(74)	50	33(66)	83
Calculated value = 3.899*				df= 1	Calculated value = 2.590				df= 1
Table value = 3.841					Table value = 3.841				

(26.31%) was in the age groups (36-45 years). The present results were somewhat agreed with the results of AL-Khashab, (2009), where he recorded the highest percentage of acute infection in the age groups (21-29 years) and (30-39 years) with the rates of 34.4% and 27.5% respectively. Al-Mayahi (2011) reported that the highest percentage of acute infections with toxoplasmosis were among young women than old ones, relationship between chronic infection with toxoplasmosis and the age of infected persons, where prevalence rates of infection increased with the increase of people ages in human societies (Tenter *et al.*, 2000).

Table 2 showed the highest rate of acute infection was in men and women, who live in the urban and rural areas (14.3% and 18.5%) respectively, while the highest rate of chronic infection was in men and women living in the urban (74.3% and 73.9%, respectively).

The results of the statistical analysis (table 2) showed significant differences in the case of acute infection. The present results agreed with the results of Al-Wattari (2005), where it showed that acute infection rates among

women living in the urban and rural were 82% and 18% respectively. The present results also agreed with the results of Al-Doori (2010), which reported the highest rate of acute and chronic infection was 32.1% and 66.7% respectively, in men living in urban areas, whereas in women living in urban the highest rate of acute and chronic infection was 53.1% and 88.9%, respectively. The present results didn't agree with the results of Al-Najjar (2005), who reported the highest rate of infection was 58% among people living in rural areas. No differences appeared between the urban and rural areas due to the several factors; the villages became modern in most parts of Iraq and the prevalence of cats in the urban areas more than rural areas because the houses in the rural areas be separately, while for urban area, uncontrolled butchers shops may have helped on prevalence of infection among population in the urban areas more than the rural ones due to the prevalence of cats (Al-Doori, 2010).

Table 3 shows the highest rate of acute infection was among uneducated men and women (14.3% and 50.0%) respectively, while the highest rate of chronic

Table 3 : Distribution of infection with *T. gondii* according to educational level for men & women.

Educate	Acute infection				Chronic infection				Total infected No.(%)
	Men		Women		Men		Women		
	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	
Un educated	7	1(14.3)	4	2(50)	7	5(71.4)	4	1(25)	9
Primary	11	1(9.1)	22	3(13.6)	11	9(81.8)	22	16(72.7)	29
Intermediate	7	2(28.6)	8	1(12.5)	7	6(85.7)	8	7(87.5)	16
Secondary	11	1(9.1)	4	0	11	8(72.7)	4	2(50)	11
University	14	1(7.1)	12	1(8.3)	14	9(64.3)	12	7(58.3)	18
Total	50	6(12)	50	7(14)	50	37(74)	50	33(66)	83
Calculated value = 2.478				df= 4	Calculated value = 8.352				df= 4
Table value= 9.487					Table value= 9.487				

infection was in men and women with intermediate school (85.7% and 87.5%), respectively.

The results of the statistical analysis (table 3) showed non-significant differences among infected people with chronic infection. The present results agreed with the results of Ahmed (2008) that pointed to the highest rate of infection were in un educated women by Latex test and ELISA (54.48% and 9.30%) respectively and it agreed with the results of Ali (2008) that showed the highest rate (38%) of infection was among the un educated women. The present results disagreed with the results of Al-Doori (2010), which mentioned that the highest rate of acute infection among men (36.0%) and women (54.1%) at the primary education level, also chronic infection of women (94.6%) at the primary level while it was agreed with the highest rate of chronic infection (72.7%) among the uneducated. Ignorance of the disease is one of the things that helps for prevalence of infection, but may be no relation between the education level and prevalence of *T. gondii* infection, because the scientific and biological aspects of the disease taught at the high education level. The knowledge with infection and its sources and ways to avoid it requires a range of health education processes and programs that are at the community level and not only at the individual level (Al-Doori, 2010).

The present results (table 4) indicated that the highest rates of acute infection prevalence according to work was among employees male and un employed women (12.5% and 16.2%) respectively, while the highest rates of chronic infection among men and women employees was 85.3% and 70.3%, respectively.

Statistical analysis (table 4) showed non-significant

differences among groups. The present results were agreed with the results of Ahmed (2008), which showed that the percentage of infection among female non employees was higher than that of female employees (7.40% and 5.26%), respectively. The increase in the rate of infection among non-employees female may be due to several of causes, it include daily activities such as housecleaning, cooking and gardencleaning or cleaning of garden rubbish (Ahmed, 2010).

The results in table 5 showed that the highest rate of acute infection was in men and women who are breeders of cats at home (33.3% and 44.4%) respectively, while the highest rate of chronic infection was in men (77.3%) and women (70.7%), who contacted with stray cats.

Statistical analysis results (table 5) showed non-significant differences among groups. The present results were agreed with results of Al-Doori (2010) concerning for women, he showed the highest rate of acute infection was in women who are breeders of cats in their homes, and it didn't agree concerning for men, also the present results associated with chronic infection agreed with the results of Al-Doori (2010) concerning for males, he showed the highest rate of chronic infection was in the males who are breeders of cats in their homes and it didn't agree in regard to women, Al-Najjar (2005) noted that the rate of infection among breeders of cats was higher than that of non-breeders (53% and 47%) respectively. The present results disagreed with the results of Al-Wattari (2005), which reported the infection rate among people who were in contact with cats (13%) was lower than in non-contact patients(87%), this result may due to the high prevalence of stray cats that contact with people, either direct contact by accession to their

Table 4: Distribution of infections with *T. gondii* according to the job for men & women.

Job	Acute infection				Chronic infection				Total infected No.(%)
	Men		Women		Men		Women		
	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	
Employee	16	2(12.5)	13	1(7.7)	16	8(50)	13	7(53.8)	18
Non-employee	34	4(11.8)	37	6(16.2)	34	29(85.3)	37	26(70.3)	65
Total	50	6(12)	50	7(14)	50	37(74)	50	33(66)	83
Calculated value = 0.660 Table value= 3.841				df= 1	Calculated value = 0.002 Table value= 3.841				df= 1

Table 5: Relationship of cats in homes with acute and chronic infection for men & women.

Cats	Acute infection				Chronic infection				Total infected No.(%)
	Men		Women		Men		Women		
	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	The investigated No.	Infected No.(%)	
Breeders for cats	6	2(33.3)	9	4(44.4)	6	3(50)	9	4(44.4)	13
Stray cats	44	4(9.1)	41	3(7.3)	44	34(77.3)	41	29(70.7)	70
Total	50	6(12)	50	7(14)	50	37(74)	50	33(66)	83
Calculated value = 0.737 Table value= 3.841				df= 1	Calculated value = 0.312 Table value= 3.841				df= 1

houses or indirect contact with Oocysts thrown from infected stray cats to drinking water or foods Al-Doori (2010).

Table 6 showed a significant increase in the total number average of leukocytes (11866 ± 2508 cells/mm³ blood and 10300 ± 2504 cells/mm³ blood) at the acute stage of infection for men and women, respectively, then the average non-significant decrease at the chronic stage of the infection (9068 ± 1975 cells/mm³ blood and 8623 ± 1810 cells/mm³ blood) for men and women respectively, compared with the control group for men and women (7280 ± 1148 cells/mm³ blood and 10300 ± 2504 cells/mm³ blood), respectively.

The present results (table 6) agreed with the results of Kadhim (2006), he indicated to non-significant differences to each the total number of leukocytes and the percentage of neutrophils in women infected (6923 ± 3004 cells / mm³ blood and $52.34 \pm 4.18\%$) respectively, compared with the control group (6390 ± 1070 cells / mm³ and $51.22 \pm 3.3\%$), respectively. Relatively eosinophilis and lymphocytes, significant differences were found in the percentage ($7.86 \pm 1.4\%$ and $41.1 \pm 4.78\%$)

respectively, compared with the control group ($4.16 \pm 1.28\%$ and $34.6 \pm 4.12\%$) respectively, the present results were also in agreement with the results of Jasem (2013), he pointed to significant differences between the acute and chronic infection in the female on the one hand and among two stages (the acute and chronic) and counterpart in the control group on the other hand, this differences for each the total number average of leukocytes (13495 ± 187 cells / mm³ blood and 12103 ± 175 cells / mm³ blood) respectively, compared with the control group (8191 ± 194 cells / mm³ blood and 7236 ± 108 cells / mm³ blood) respectively, and each the number average of monocytes (769 ± 42 cells / mm³ blood and 550 ± 92 cells / mm³ blood) respectively, compared with control group (433 ± 42 cells / mm³ blood and 360 ± 28 cells / mm³ blood) respectively, and the number average of neutrophils (3776 ± 126 cells / mm³ blood and 2683 ± 274 cells / mm³ blood) respectively, compared to control group (1616 ± 49 cells / mm³ blood and 879 ± 75 cells / mm³ blood) respectively, and the number average of eosinophilis (1024 ± 101 cells / mm³ blood and 692 ± 49 cells / mm³ blood), respectively, compared with control group (165 ± 19 cells / mm³ blood and 86 ± 10 cells /

Table 6 : The total and differential number mean of leukocytes \pm SD in men and women infected with *T. gondii* and its comparison with control.

Groups		Acute infection		Chronic infection		Control	
		Men	Women	Men	Women	Men	Women
The differential number of leukocytes	The total number of leukocytes (Cell/ml³ blood)	11866 \pm 2508A	10300 \pm 2504AB	9068 \pm 1975BC	8623 \pm 1810BCD	7280 \pm 1148CD	6920 \pm 638D
	Lymphocyte(Cell/ml³ blood)	4563 \pm 1167A	3822 \pm 1220AB	3422 \pm 1263BC	3166 \pm 855BC	2749 \pm 667C	2718 \pm 347C
	Monocyte (Cell/ml³ blood)	658 \pm 203A	667 \pm 261A	560 \pm 174AB	609 \pm 178AB	452 \pm 97B	539 \pm 74AB
	Neutrophil (Cell/ml³ blood)	5710 \pm 1386A	4858 \pm 1300AB	4244 \pm 1251BC	4088 \pm 1090BC	3480 \pm 631C	3166 \pm 292C
	Eosinophil (Cell/ml³ blood)	794 \pm 218A	845 \pm 193A	661 \pm 263AB	634 \pm 234AB	540 \pm 102B	456 \pm 128B
	Basophil(Cell/ml³ blood)	141 \pm 67A	108 \pm 96AB	179 \pm 86A	120 \pm 81AB	58 \pm 34B	40 \pm 36B

Similar letters indicate to non-significant differences ($P > 0.05$) among groups (horizontal compare).

Different letters indicate to significant differences ($P \leq 0.05$) among groups (horizontal compare).

mm³ blood) respectively, and the number average of basophilis (8 ± 3 cells / mm³ blood and 3 ± 3 cells / mm³ blood) respectively, compared with control group (0 ± 0 cell / mm³ blood and 0 ± 0 cell / mm³ blood) respectively, while non-significant differences observed in the number average of lymphocytes (7918 ± 90 cells / mm³ blood and 8175 ± 310 cells / mm³ blood) respectively, compared to control group (5977 ± 78 cells/mm³ blood and 5911 ± 93 cells / mm³ blood) respectively.

The total number increased of leukocytes (when compared with control group) indicates to a systemic immune response against infection, and this increase in cells count is a cellular immune response. The parasitic protozoa leads to the secretion increase of cytokines (INF- α , IL-1 and IL-12) which cause fever and the total number increase of leukocytes (Japayal, 2007; Male *et al.*, 2013). As for the differential number of leukocytes, that infection with *T. gondii* accompanied by the infiltration of monocytes and lymphocytes for the control on the parasite reproduction and reduce the infection, this infiltration occurs directly when contact between the parasite and the host occurs, as well as this infiltration is response to produced antigens by the parasite after infection. It should be indication to that monocytes migrate from the blood to different tissues of the body to settle in those tissues and are then called macrophage that have high phagocytosis potential for each pathogens and foreign bodies that invade host's body (Ley *et al.*, 2007). Monocytes infiltration to the site of infection, to become able to produce a colony stimulating factor, which moves by the bloodstream to the bone marrow to stimulate the production of leukocytes and multiply of all types, causing an increase in the number of peripheral blood cells (Dunay *et al.*, 2010; Guyton and Hall, 2016).

The significant increase in lymphocytes number averages in the infection may be due to the protein 30 derived from *T. gondii* have the ability to stimulate T cells (CD8⁺) and increase their ability to produce IL-2 and INF- α , and these cells also have a deadly efficacy of the parasite directly. Liu *et al.* (2010) reported *T. gondii* have SAG1 antigen that causes stimulation of lymphocyte reproduction and antibodies production and INF- α . Suzuki *et al.* (2010) showed that INF- α produced by lymphocytes stimulated by parasite antigens and which is the main mediator for preventing multiply of tachyzoites during the acute phase of infection.

The number averages of neutrophilis was increased during the acute and chronic stages of infection, this increase can be attributed to cytokines, which secreted from macrophages for activated of neutrophilis (Janeway *et al.*, 2005). The neutrophilis have a high ability to phagocytosis (so called microphages). Bohannon *et al.*, 2010) indicated to the depletion of neutrophilis causes inability to generate an effective immune response against *T. gondii*.

Eosinophils increase is an indication of the immune response in the parasitic infections, especially worms Gunstream, 2013). They have the ability to phagocytosis of parasitic invaders (Stanfield, 2013). While, Fenoy *et al.* (2009) pointed to that infection with *T. gondii*. causes infiltration of monocytes and eosinophilis into the membranes of the respiratory ducts and this contributes to reducing allergic inflammation.

The basophilis are characterized by very few in blood in normal conditions (Gunstream, 2013). The increase of basophilis in peripheral blood in the acute stage of infection with *T. gondii* is due to the proliferative

Table 7 :Relationship between the number of miscarriage cases and the type of infection among women by detected using ELISA.

Number of miscarriages	Number of aborted Women (%)	Number of positive cases by checking ELISA IgM-IgG		
		The total No.(%)	Acute(%)	Chronic (%)
Once	30(60)	23 (76.7)	3(13)	20(87)
Twice	9(18)	9(100)	2(22.2)	7(77.8)
Three times	10(20)	7(70)	1(14.3)	6(85.7)
> Four times	1 (2)	1 (100)	1(100)	0
The total No.	50	40(80)	7(17.5)	33 (82.5)
Calculated value = 5.220		df= 3		
Table value = 7.814				

stimulation of bone marrow cells as a result of infection. All Leukocytes originate from bone marrow (Guyton and Hall, 2016). The decrease in the basophils number average in chronic infection can be attributed to the migration of these cells to the infection site, as the basophilis included in the defense mechanisms against parasitic infections through the interaction of local tissue leading to enhancing acute inflammation (Male *et al.*, 2013).

Table 7 shows the percentage of miscarriages according to the number of miscarriage women under study in Samarra, where the percentage reached of aborted women of once 76.7% (it distributes to 13.0% for acute infection and 87.0% for chronic infection), and 100% of abortion twice (it distributes to 22.2% for acute infection and 77.8% for chronic infection), while the percentage of total number of aborted women of three times reached to 70%, (it distributes to 14.3% for acute infection and 85.7% for chronic infection), either the percentage of miscarriages more than three times was 100% for acute infection only.

The statistical analysis results (table 7) by using Chi-square (χ^2) test showed non-significant differences between acute and chronic infection and abortion times number. Al-Rawi (2009) showed the number of repeated miscarriages of infected women with *T. gondii*. The highest percentage (80%) was for miscarriage of once and twice, and the lowest percentage (20%) was in repeated miscarriage three times or more. Al-Mayahi (2011) reported that the percentage of miscarriages for infected women with *T. gondii* was 54.42% of miscarriage once and 44.96% for twice and 34.88% for three times and 29.44% for four times and 25% for five times.

The infection with *T. gondii* causes congenital toxoplasmosis. If a mother contracts acute toxoplasmosis at the time of her child's conception or during pregnancy,

the organisms often will infect her developing fetus. Fortunately, most neonatal infections are asymptomatic, but a significant number cause death or disability to newborns. It is generally assumed that *T. gondii* crosses the placental barrier from the mother's blood. Stillbirths and spontaneous abortions may result from fetal infection with *T. gondii* in humans. Maternal infection in the first three months of pregnancy results in more extensive pathogenesis, but transmission to a fetus is more frequent if maternal infection occurs in the third trimester (Roberts and Janovy, 2009).

Conclusion

The rate of infection is high in each men and women. The rate of chronic infection is higher than acute infection. Elevation of infection rates among 18-24 age groups and among 32-38 age groups. There is no relationship between educational level and infection. There were non significant differences among breeders of cats and non-breeders.

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