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Seroprevalence of Toxoplasmosis in Goat in Baghdad governorate

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Abstract

Infections by the protozoan parasite *Toxoplasma gondii* are widely prevalent in humans and animals worldwide. Toxoplasmosis is a disease that causes abortions, weak kids, stillbirths, birth defects, and mummification of fetuses in pregnant does (doe).Contaminated grain, grass, or hay by infected cat feces are the source of infection for the goats. This study intends to investigate the seroprevalence of goat's toxoplasmosis by using serological tests (Latex agglutination test and indirect ELISA). One hundred goat sera (78 females and 22 males) were collected from Baghdad city during the period 1/10/2015 until 31/3/2016. The results showed that the females had a high Toxoplasmosis infection rate than males. In Latex agglutination test and ELISA, the infection rate was 64.10% and 87.32 % in female respectively and 45.45% and 71.42% in male respectively, meanwhile the infection rates were increased with the age of the animals. Moreover, the infection rate by latex agglutination test was 54.16% and 61.84% in animals under 2 years and over 2 years age respectively. In addition, the infection rate in ELISA was 75% and 86.76% in animals under 2 years and over 2 years age respectively. In conclusion, this study approved the seroprevalence of toxoplasmosis in goats. Moreover, the latex agglutination test and ELISA have the ability to determine the toxoplasmosis in goats. The authors recommend using these tests to diagnose the toxoplasma infection in flocks of the goat.

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Introduction

Toxoplasma gondii is a component of intracellular protozoan (Smith, 1995). It is the causative agent of Toxoplasmosis in animals and humans (Dubey, 1998). Animals become infected with Toxoplasma when they eat grain, grass, or hay which has been contaminated by infected cat feces. The infection gets into the body via the small intestine and closes to the lymph nodes, then extend throughout the animal's system via the blood stream. In goat, *Toxoplasma gondii* can be encysted for years in the body's muscles, liver, brain, or in the other vital organs. However, previously-infected does show some

resistance to future infection (acquired immunity), in addition, the male goats can be carriers for this protozoa. Meanwhile, the toxoplasmosis-positive does give birth for weak kids (Nikolaos *et al.,* 2012). Infection with toxoplasma can also occur accidentally by ingestion or handle the contaminated meat, undercooked, and not wash hands thoroughly. However, Toxoplasma cannot be absorbed through intact skin. Toxoplasmosis, also occurs by the eating food contaminated via contact with raw infected meat or handle by contaminated utensils, knives and cutting boards (Flegr, 2013). The parasite is one of the important causes of abortion in domestic livestock and causes abortion and congenital defects in humans. In the farm animals, infection poses a risk to public health as well as economic losses to the farming industry (Sibley *et al.,* 1999). Rapid and accurate diagnosis of Toxoplasmosis is essential for the research tool. It is necessary for understanding the role of animal reservoirs in the spread of infection, and it is also important for the management of human infections. Detection of antibodies to *T. gondii* by indirect diagnosis is possible but is less useful in determining the timing of infection. There were various serological tests used to establish Toxoplasma infection such as indirect immunofluorescence (Van der Puije *et al.,* 2000), indirect haemagglutination (Nieto and Melendez, 1998), Latex Agglutination test (Ahmad, 1999) and enzyme-linked immunosorbent assay (Hashemi-Fesharki, 1996). *T. gondii* antibodies have been found worldwide in 62 animals and humans.
For the author's knowledge, there are scant epidemiological data on toxoplasmosis in the goat in Iraq, therefore, this study intends to estimate the seroprevalence of *T. gondii* infection in goats in Baghdad governorate using serological tests (Latex agglutination test and indirect ELISA).

Materials and methods

Collection of blood samples

One hundred blood samples of goats aged (≤ 1-3 ≥) years from different regions of Baghdad city were collected from first October 2015 to 13 March 2016. About 10 ml blood samples collected from the jugular vein of each goat and keep in tubes without anticoagulant. Later on, the samples kept in a cold box and transferred to Veterinary Laboratory in Al –Nahdha. All samples placed in a refrigerator at (4-8ºC) overnight. All samples centrifuged at 3000 rpm/for 10 minutes and serum collected and kept in sterile plastic tubes (screw tubes) and stored at -18°C for further investigation. Specific antibodies against Toxoplasma gondii detected by the Latex agglutination test (Goat Toxo-latex, France) according to the manufacturer instructions. Enzyme-linked immune sorbent assay (ELISA) was done using goat ELISA kit following the instructions described by the manufacturer.

Results

In Latex agglutination test, 10 out of 22 males and 50 out of 78 female revealed positive reaction for Toxoplasma gondii. Meanwhile, the percentages of seroprevalence were 64.10 % and 45.45 % in female and male respectively. Moreover, the total percentage of positive animals that showed positive reaction was 60 (60%) (Table.1). In ELISA, the

number of positive animals was 15 out of 21 male and 62 out of 71 females. Moreover, the percentages of the seroprevalence were 71.42 % and 87.32 % in male and female respectively. A significant difference (P<0.01) appeared between females and males by ELISA test, as well as significant differences (P<0.01) also occurred between females for the Latex reading and ELISA reading. The statistical analysis of the data according to the age of the groups revealed a relationship between the age of the animal and rate of infection. The infection rate of Toxoplasmosis elevated with the age of the animal. By ELISA, the infection rate showed the highest rate in age group > 2 (86.76%), while the lowest infection rate (54.16%) appeared in age group < 2 by Latex test. There was also significant differences (P<0.01) between the 2 group in ELISA. (Table .2). The analysis of latex agglutination test (Table.3) showed that males under and over 2 years had a lower infection rate (50%, 45.45%) compared to the females (57.14%, 58.33%). Also in ELISA, males had lower infection rates (62.50%, 76.92%) than females (75%, 90.90%) in the age group under and over 2 years. There was significant differences (P<0.01) appear between females and males in age group > 2 in ELISA test and between Latex and ELISA test in the same group. , Moreover, significant differences (P<0.05) was also observed between Latex and ELISA test in females and males in age group < 2.

Table.1: Percentage of goats Toxoplasmosis by using latex agglutination test and indirect ELISA in both sex.

Test	Sex	No.	Positive	
			No.	%
Latex	Males	22	10	45.45
	Females	78	50	64.10
Total		100	60	60.00
ELISA	Males	21	15	71.42
	Females	71	62	87.32
Total		92	77	83.69

*(P<0.01) **(P<0.05)

Table (2): Percentage of goats Toxoplasmosis by using latex agglutination test and indirect ELISA according to age.

Test	Age years	No.	Positive	
			No.	%
Latex	<2	24	13	54.16
	>2	76	47	61.84
Total		100	60	60.00
ELISA	< 2	24	18	75
	> 2	68	59	86.76
Total		92	77	83.69

*(P<0.01)

Table (3): Percentage of goats Toxoplasmosis by using latex agglutination test and indirect ELISA according to sex and age.

Test	Age(years)	Sex	No.	Positive	
				No.	%
Latex	< 2	Males	10	5	50
		Females	14	8	57.14
	> 2	Males	12	7	45.45
		Females	64	40	58.33
	Total		100	60	60.00
ELISA	< 2	Males	8	5	62.50
		Females	16	12	75.00
	> 2	Males	13	10	76.92
		Females	55	50	90.90
	Total		92	77	83.69

*P<0.01 ** P<0.05

Discussion

Toxoplasmosis is a global zoonotic disease caused by *T. gondii* and has been reported in many countries since 1908 (Dubey and Beattie, 1988). There are many predisposing factors that effects on the percentage of infection and may attribute to the host-parasite relationship. These factors include the virulence of the parasite, immune status, time of infection, season, feeding habit of the animal, nature of the area and the presence of cats, which is considered as the main source of infection for ruminants, (Gamarra *et al.,* 2008). Abouzeid *et al.,* (2010) noticed that the percentage of infection was varied from region to region. This variation may contribute to the difference of the environmental and ecological condition, which affect the biology of the parasite or the system of breeding and hygienic measures inside the farms. The prevalence of toxoplasmosis also varies among countries, depending on traditions, customs and the lifestyles of the inhabitants (Smith, 1995). *T. gondii* infection was distributed worldwide, with prevalence rates ranging from 0% to 100% in different countries and even in areas of the same State (Dubey and Beattie, 1988; Tenter, 2000; Olivier *et al.,* 2007). *T. gondii* Infection with the parasite may cause early embryonic death, fetal death and mummification, abortion, stillbirth, and neonatal death (Djurkovic-Djakovic and Thulliez, 2007). It is well known that the Latex test is simpler and easier than ELISA technique. However, ELISA is a useful and precise tool for serodiagnosis studies but needs particular preparations. The results of the current study revealed high percentages of seroprevalence goats of the both sex and different age groups. These results indicated the exposure of these animals to the *T. gondii* from the final host (cats) (Zhou *et al.,* 2012; Sreekumar *et al.,* 2005), in addition to the presence of other predisposing factors such as bad feeding habits and weather. These results are in agreement with previous observations reported by Dubey, (2009), who mentioned that the predisposing factors play a major role in the epidemiology and prevalence of the toxoplasmosis. Besides, Dubey, (2009) was also suggested that infection by toxoplasmosis differs from area to area and year to year according to the presence of cats, its movement, feeding and type of grazing. The detection of specific antibodies against Toxoplasma considers as an important tool for the diagnosis. Abouzeid *et al.,* (2010) mentioned that latex agglutination test was an unreliable tool for diagnosis of toxoplasmosis in goats, if it is applied one week before or after kidding. On the other hand, ELISA is as the useful for serodiagnosis (Ryu *et al.,* 1996) and can be used in screening survey (Dubey, 2009). The route of infection in the human and animals is occurred via the ingestion of the infected tissue cysts (sporulated Toxoplasma oocysts)

or consumption of raw or undercooked meat of infected slaughtered animals or from contaminated soil by parasite cysts. The current result was inconsistent with previous studies including (El-Ghaysh and Mansour, 1994), who recorded 47 and 50% of sheep positive for ELISA and IFAT respectively. The results of this study is also in agreement with Kandil and Abou-Zeina, (2000), who found that 37% of sheep positive by ELISA. Other study revealed the higher prevalence of toxoplasmosis (43.7%) and (41.7%) by latex test and ELISA respectively, using antigen prepared from isolated *T. gondii* local strain (Shaapan *et al.,* 2008). The variation between the results of the current study and the previous study revealed that there is a variation in the predisposing factors between the different studies. These factors are including immune state, age, numbers, and environment condition. These observations were in agreement with (Shaapan *et al.,* 2008), who approved the variation of the prevalence of infection some country from one location to another due to differences in certain ecological factors and breeding system in these areas. The high percentage of animals positive for *T. gondii* serological examination may indicate that this parasite causes a significant problem for the animal health. These fact was in agreement with (Dubey, 2009), who found that Toxoplasmosis causes great losses in goat including embryonic death and resorption, stillbirth and neonatal death in these animals. Moreover, Shaapan, (2015) recorded that most sheep acquire the postnatal infection by ingestion of the protozoal oocysts from a contaminated environment or ingestion of infected animals tissues. Besides, this disease can cause serious economic losses to sheep industry all over the worldwide, especially at lambing time. Serodiagnosis applied in this study to investigate *T. gondii* in the goat. The disease can induce mild clinical signs in infected animals. Therefore detection of Toxoplasma antibody plays a major role in the diagnosis of this disease (Malik *et al.,* 1990). In this study, the higher infection rate that found among adult goat in comparison to the young goats may be attributed to the feeding habit of the goat. Goats are usually grazed short grasses and lick soil around them thus, are liable to contract the infection with *T. gondii* oocysts. Moreover, stray cats may easily enter the environment of the goat. These observations agreed with that obtained by (Malik *et al.,* 1990; Lunden *et al.,* 1993). In Basra, the seroprevalence of ovine toxoplasmosis by Latex agglutination test was (60.84%) and by ELISA (51.11%) (AL-Husseiny, 2009; Khadi *et al.,* 2009). The study has also approved the variations in the infection rates between different provinces in the south of Iraq. The infection rates were (25.00%), (16.06%) and (12.71 %) in sheep by ELISA in Mesan, Muthanna and Thyqar respectively. Whereas, in Mosul, a high infection rate (79.00%) was recorded by Al-Taee, (2002). Abd-Al Hameed, (2007) found a significant difference between the regions farms and villages in the same areas. The epidemiology of toxoplasmosis may be affecting by many factors such as weather, feeding habits, and the presence of the final hosts. The most animals more than four years were negative to both tests (Latex and ELISA), which may be due to the decrease in the levels of antibodies that lead to undetectable of the antibodies titers (AL-Bermani, 2012). However, Oncel and Vural, (2006) found a high prevalence of toxoplasmosis in the animals at age group over one year. The previous study found that out of one hundred goats sera that slaughtered in the abattoir of Zagazig / Cairo, there were 29% and 27% positive samples by Latex and Indirect haemagglutination (IHA) respectively (Abouzeid *et al.,* 2010). Literák *et al.,* (1995) was also detected antibodies against the disease in 20% of goats in the Czech Republic and Slosark. Skjerve *et al.,* (1998) explained that

there was a direct correlation between the presence of cats and the incidence of *Toxoplasma gondii* in the livestock. Puije *et al.,* (2000) found that older sheep had a higher prevalence of infection than younger. In conclusion, this study approved that the latex agglutination test and ELISA have the ability to determine the toxoplasmosis in goats. In addition, the seroprevalence of toxoplasmosis was determined in male and female goats. Meanwhile, positive seroprevalence rate was higher in the female than male goats. The study also approved variation between the seroprevalence goats according to the age. The authors recommend using these tests to diagnose the toxoplasma infection in flocks of goat.

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