

Seroprevalence of *Toxoplasma Gondii* in cattle, Sheep and Goats from River Nile State, Sudan

Shadia Ahmed M Lazim^{1*}, Abdalla Mohamed Ibrahim² and Amani Bushra Ahmed³

¹College of Veterinary Medicine, University of West Kordofan

²Abrar Research and Training Centre, Abrar University, Somalia

³College of Veterinary Medicine, University of Bahri

***Corresponding Author:** Shadia Ahmed M Lazim. College of Veterinary Medicine, University of West Kordofan.

Received: April 17, 2018; **Published:** May 08, 2018

Abstract

Animal toxoplasmosis is of public health and economic importance worldwide. The present study designed to investigate the disease in cattle, sheep and goats in River Nile State during January to March 2016. A total of 191 serum samples were checked for antibody against *T. gondii* using Latex Agglutination Test. The overall prevalence rate was 16.8%. Statistically significant variation ($p = 0.017$) between the two investigated areas (Atbara and Eldamar) was observed. Goats revealed significantly ($p = 0.000$) higher prevalence rate (27.9%) than by sheep (26.5%) and cattle (6.2%).

The prevalence rate was also affected significantly by sex ($p = 0.026$) and age groups ($p = 0.28$). Breed variation has no statistically significant ($p = 0.382$) effect in the seroprevalence rate of toxoplasmosis in this study. Without any statistically significant differences ($p > 0.05$), the level of antibody titration was higher in goats than in sheep and cattle, in females than in males, in aged animals than in the young ones. In the present study, 12.5% of the new borne animals (1-6 months) were seropositive for *T. gondii* infection. Up to our knowledge, this paper may be the first report on seroprevalence of animal toxoplasmosis in the River Nile State. Extension and education for consumption of proper cooked meat and milk will be of public health value in the State.

Keywords: Toxoplasmosis; Seroprevalence; LAT; River Nile; Sudan

Volume 2 Issue 2 May 2018

© All Copy Rights Reserved by Shadia Ahmed M Lazim, *et al.*

Introduction

Toxoplasma gondii is one of the most important causes of protozoal parasitic infectious abortion in livestock worldwide (Malik, *et al.* 1990; Huong, *et al.* 1998). The parasite is widely prevalent in humans and animals on all continents (Dubey 2004; Innes 2011; Ibrahim and Abakar 2015). Most of human infection were during consumption of raw or under-cooked meat or other edible parts of meat producing animals (Slifko, *et al.* 2000; Tenter, *et al.* 2000; Ibrahim, *et al.* 2015).

Citation: Shadia Ahmed M Lazim, *et al.* "Seroprevalence of *Toxoplasma Gondii* in cattle, Sheep and Goats from River Nile State, Sudan". *Multidisciplinary Advances in Veterinary Science* 2.2 (2018): 332-337.

The worldwide average value of seroprevalence of *T. gondii* infection in cattle was 9% (Dubey, 2004; Nematollahi and Moghaddam 2008). In Iran, Hashemi-Fesharki (1996) fail to detect antibodies against *T. gondii* in cow sera diluted 1:8 and 1:64 using LAT and IHAT respectively. However, Ciamak-Ghazaoui, (2005) and Nematollahi and Moghaddam (2008) reported 9% and 15.9% seroprevalence of cattle toxoplasmosis using ELISA and IFAT respectively.

The first available data on cattle toxoplasmosis in Western and Central Sudan was reported by Zein Eldin., *et al.* (1985). Thereafter, the parasite was investigated in cattle from central Sudan using different serological techniques (Khalil and Elrayah 2011; Elfahal., *et al.* 2013; Ibrahim., *et al.* 2014).

There are numerous reports on seroprevalence of toxoplasmosis in sheep worldwide, ranging from 0% to 100% (Fayer 1981; Tenter., *et al.* 2000; Ortega-Mora., *et al.* 2007). According to Fayer (1981), the world average of seroprevalence of sheep and goats was 31%. Toxoplasmosis occurs in all breeds (Ragozo., *et al.* 2009), sex (Bonyadian., *et al.* 2007) and age (Bahrieni., *et al.* 2008; Anamaria., *et al.* 2008) groups of ewes and their foetuses. In Egypt, serological surveys indicated that the incidence of infection average was 9.4 and 6.9% in sheep and goats respectively (Hassan., *et al.* 2000).

In Sudan, the earliest studies on sheep and goats were carried out by Elbedawi., *et al.* (1984) and Zein Eldin., *et al.* (1985). The most recent serological studies were that of Abdel Hafez (2013) and Ibrahim., *et al.* (2014).

Most of the available data on animal toxoplasmosis in the Sudan was collected from the Central Sudan. The present study was planned to address the prevalence of animal toxoplasmosis in River Nile State using Latex agglutination test.

Materials and Methods

Study area

The study was conducted in the River Nile State which located in Northern Khartoum State and between altitude 16°E-22°E and longitude 32°N - 35°N. The area of the state is 124, 000km². The climate of the state is semi-desert. The average of temperature ranges from 47°C in the summer to 8°C in the winter. The numbers of animals in the River Nile State are modest compared to other states of the country. It estimated of 1,034,655 sheep, 1,211,095 Goat, 100,701 cattle, and 114,103 camel. The study areas included Atbara and Elda mar.

Animals: The study population encompassed 191 animals of different sex and age including cattle (96 heads), sheep (34 heads) and goats (61 heads).

Samples: Blood samples were obtained from the jugular vein of 191 animals during January-March 2016. Serum was removed from each clotted blood sample and stored at -20°C until tested.

Latex Agglutination Test (LAT)

The Toxo-Latex diagnostic kit (*Spinreact*, S.A./S.A.U, Spain) was purchased from *Shifak Company*, Khartoum, Sudan (Appendix 1). Initially, all sera were examined qualitatively based on the LAT manufacturer's instructions. Visible clumps indicate positive agglutination. The positive samples were subjected to semi-quantitative test to obtain the level of antibody titration using serial double dilutions of 1:4 up to 1:256.

Data analysis: Data was analyzed using the statistical package for social sciences (SPSS) version 20. A p-value less than 0.05 were considered statistically significant.

Results

Seroprevalence rates of *T. Gondii* infection in River Nile State

The overall sero-prevalence rate in the examined animals was 16.8% (table 1). Eldamar area showed higher prevalence rate than Atbara with statistically significant variation ($p = 0.017$). The prevalence rates were significantly varies ($p = 0.000$) between the three different animal species (table 2). As shown in table (4 & 5), significant differences were observed in the seroprevalence of *T. gondii* infection between the different sexes ($p = 0.026$) and the different age groups ($p = 0.28$). However, there was no any statistically significant variation ($p = 0.382$) in the prevalence rate between the local and the foreign breeds (table 3).

Titration of antibodies against *T. gondii* in the positive reactions

The distribution of specific antibody titers to *T. gondii* positive reaction was not significantly ($p > 0.05$) affected by the different areas, animal species, breeds, sexes or age groups (table 1, 2, 3, 4, 5). However, the positive sera of goats and sheep recorded the highest level of antibody titration (1:128) while the highest titration in cattle was 1:16 (table 2). Female animals showed higher titration than males (table 4) and the titration increased with the age (table 5).

| Area | N (%) | P +ve (%) | Distribution of specific antibody titers to <i>T. gondii</i> positive reaction (%) | | | | |
|---------|-----------|-----------|--|---------|---------|---------|---------|
| | | | 1:4 | 1:8 | 1:16 | 1:32 | 1:128 |
| Atbara | 140(73.3) | 18(12.9) | 2(11.1) | 5(27.8) | 6(33.3) | 3(16.7) | 2(11.1) |
| Eldamar | 51(26.7) | 14(27.5) | 3(21.4) | 4(28.6) | 3(21.4) | 3(21.4) | 1(7.1) |
| Total | 191 | 32(16.8) | 5(15.6) | 9(28.1) | 9(28.1) | 6(18.8) | 3(9.4) |
| P-value | 0.017 | 0.884 | | | | | |

Table 1: Sero-prevalence of *T. gondii* in the two areas of the State.

| Animal | N (%) | P +ve (%) | Distribution of specific antibody titers to <i>T. gondii</i> positive reaction (%) | | | | |
|---------|----------|-----------|--|---------|---------|---------|---------|
| | | | 1:4 | 1:8 | 1:16 | 1:32 | 1:128 |
| Cattle | 96(50.3) | 6(6.2) | 1(16.7) | 2(33.3) | 3(50.0) | 0(0.00) | 0(0.00) |
| Sheep | 34(17.8) | 9(26.5) | 2(22.2) | 1(11.1) | 4(44.4) | 2(22.2) | 0(0.00) |
| Goats | 61(31.9) | 17(27.9) | 2(11.8) | 6(35.3) | 2(11.8) | 4(23.5) | 3(17.6) |
| Total | 191 | 32(16.8) | 5(15.6) | 9(28.1) | 9(28.1) | 6(18.8) | 3(9.4) |
| P-value | 0.000 | 0.322 | | | | | |

Table 2: Sero-prevalence of *T. gondii* in the different animal species.

| Breed | N (%) | P +ve (%) | Distribution of specific antibody titers to <i>T. gondii</i> positive reaction (%) | | | | |
|---------|-----------|-----------|--|---------|---------|---------|---------|
| | | | 1:4 | 1:8 | 1:16 | 1:32 | 1:128 |
| Local | 106(55.5) | 20(18.9) | 2(10.0) | 4(20.0) | 8(40.0) | 4(20.0) | 2(10.0) |
| Foreign | 85(44.5) | 12(14.1) | 3(25.0) | 5(41.7) | 1(8.3) | 2(16.7) | 1(8.3) |
| Total | 191 | 32(16.8) | 5(15.6) | 9(28.1) | 9(28.1) | 6(18.8) | 3(9.4) |
| p-value | 0.382 | 0.280 | | | | | |

Table 3: Sero-prevalence of *T. gondii* in the different breeds.

| Sex | N (%) | P +ve (%) | Distribution of specific antibody titers to <i>T. gondii</i> positive reaction (%) | | | | |
|---------|-----------|-----------|--|---------|---------|---------|---------|
| | | | 1:4 | 1:8 | 1:16 | 1:32 | 1:128 |
| Male | 55(28.8) | 4(7.3) | 0(0.00) | 2(50.0) | 1(25.0) | 1(25.0) | 0(0.00) |
| Female | 136(71.2) | 28(20.6) | 5(17.9) | 7(25.0) | 8(28.6) | 5(17.9) | 3(10.7) |
| Total | 191 | 32(16.8) | 5(15.6) | 9(28.1) | 9(28.1) | 6(18.8) | 3(9.4) |
| P-value | 0.026 | 0.730 | | | | | |

Table 4: Sero-prevalence of *T. gondii* the different sexes.

| Age | N (%) | P +ve (%) | Distribution of specific antibody titers to <i>T. gondii</i> positive reaction (%) | | | | |
|------------|----------|-----------|--|---------|---------|---------|---------|
| | | | 1:4 | 1:8 | 1:16 | 1:32 | 1:128 |
| 1-6 month | 50(62.2) | 4(8.0) | 1(25.5) | 2(50.0) | 0(0.00) | 1(25.5) | 0(0.00) |
| 7-15 month | 39(20.4) | 10(25.6) | 1(10.0) | 2(20.0) | 3(30.0) | 3(30.0) | 1(10.0) |
| 2-5 year | 78(40.8) | 17(21.8) | 3(17.6) | 4(23.5) | 6(35.3) | 2(11.8) | 2(11.8) |
| 6-12 year | 24(12.6) | 1(4.2) | 0(0.00) | 1(100) | 0(0.00) | 0(0.00) | 0(0.00) |
| Total | 191 | 32(16.8) | 5(15.6) | 9(28.1) | 9(28.1) | 6(18.8) | 3(9.4) |
| P-value | 0.028 | 0.844 | | | | | |

Table 5: Sero-prevalence of *T. gondii* in different ages.

Discussion

The present study pointed out that, the seroprevalence rate of *T. gondii* infection in goats (27.9%), sheep (26.5%) and cattle (6.2%) were higher than the world average (Fayer 1981; Dubey, 2004). These results were lower than the results obtained from Central and Western Sudan (Zein Eldin., *et al.* 1985; Khalil and Elrayah 2011; Abdel Hafez 2013; Ibrahim., *et al.* 2014), and higher than the reports from Egypt (Hassan., *et al.* 2000), South Africa (Abusamra., *et al.* 2007) and Iran (Bahrieni., *et al.* 2008). The higher infection rate in goat than the in sheep is in contrast with the findings in many Seroprevalence studies in Iran (Bahrieni., *et al.* 2008) and Sudan (Ibrahim., *et al.* 2014; Zein Eldin., *et al.* 1985). Lower infection in cattle compared to those in goats and sheep may be attributed to the differences in susceptibility to *T. gondii* and to the feeding habits of these animals (Bahrieni., *et al.* 2008; Dubey and Hamir 2002). In agreement with many authors (Wiss and Kim 2007; Taylor., *et al.* 2007; Ortega-Mora., *et al.* 2007; Innes, 2011), the present work also confirmed that, goats and sheep were more susceptible to *T. gondii* infection than cattle when they recorded the highest seroprevalence and antibody titration (1:128). Hashemi-Fesharki, (1996) found no positive reaction against *T. gondii* in sera of 2000 cows. Therefore, he and Dubey (1986) supported the hypothesis that cattle are not favored hosts for *T. Gondii*. However, at least one outbreak of human toxoplasmosis whose source was raw beef has been documented (Smith 1993).

Toxoplasmosis occurs in all breeds (Abdel Hafez 2013; Ragozo., *et al.* 2009), sex (Gebremedhin., *et al.* 2013; Nematollahi and Moghaddam 2008; Bonyadian., *et al.* 2007) and age groups (Bahrieni., *et al.* 2008; Anamaria., *et al.* 2008). In the present study, the tested factors like area, animal species, sex and the age were found to have significant effect ($p < 0.05$) on the seroprevalence of *T. gondii* infection in the River Nile state.

In this study, 12.5% of the seropositive cases are new borne animals (1-6 month). This may increase the possibility of the occurrence of congenital transmission in the tested animals. In the Sudan people prefer sheep mutton; however, the majority of them consume beef, thus increasing the importance of cattle as a source of toxoplasmosis infection in the country. Under-cooked meat of sheep, goats and cattle are widely consumed in the Sudan (Elhassan., *et al.* 1991).

Up to our knowledge, this is the first evidence of animal toxoplasmosis in the River Nile State. Extension and education for consumption of proper cooked meat and milk in the area is recommended.

References

1. Abu Samra N., *et al.* "Seroprevalence of toxoplasmosis in sheep in South Africa". *Journal of The South African Veterinary association* 78.3 (2007): 116-120.
2. Anamaria I., *et al.* "Seroprevalence of *Toxoplasma Gondii* in sheep for human consumption in two slaughter-house". *Bulletin UASVM, Veterinary Medicine* 65.2 (2008): 40-43.
3. Bahrieni M., *et al.* "Risk factors analysis associated with seropositivity to *Toxoplasma Gondii* in sheep and goats in Southern eastern Iran using Modified Agglutination Test (MAT)". *Iranian Journal of Parasitology* 3.1 (2008): 38-43.
4. Bonyadian M., *et al.* "Seroprevalence of antibodies to *Toxoplasma Gondii* in sheep in center of Iran". *Pakistan Journal of Biological Sciences* 10.18 (2007): 3228-3230.
5. Ciamak-Ghazaoui DVM. "Serological survey of antibodies to *Toxoplasma Gondii* in Ardabil, Iran". *Journal of Applied Research in Veterinary Medicine* 3.1 (2005): 44-47.
6. Dubey JP. "A review of Toxoplasmosis in cattle". *Veterinary Parasitology* 122.3.4 (1986): 177-202.
7. Dubey JP and Hamir AN. "Experimental toxoplasmosis in budgerigars (*Melopstacus undulates*)". *Journal of Parasitology* 88.3 (2002): 514-519.
8. Dubey JP. "Toxoplasmosis-A Water Borne Zoonosis." *Veterinary Parasitology* 126.1.2 (2004): 57-72.
9. El Badawi KS., *et al.* "Serological demonstration of toxoplasmosis among sheep in Sudan". *Journal of the Egyptian Society of Parasitology* 14.1 (1984): 289-293.
10. El Hassan AM., *et al.* "The "Marrara Syndrome": Isolation of *Inguatula seerrata* nymphs from a patient and the viscera of goats". *Transactions of the Royal Society of Tropical Medicine and Hygiene* 85.2 (1991): 309.
11. Elfahal AM., *et al.* "Seroprevalence of *Toxoplasma Gondii* in Dairy Cattle with Reproductive Problems in Sudan". *Veterinary Science* (2013).
12. Fayer R. "Toxoplasmosis update and public health implication". *The Canadian Veterinary Journal* 22.11 (1981): 344-352.
13. Gebremedhin E., *et al.* "Sero-epidemiology of *Toxoplasma Gondii* infection in women of child-bearing in central Ethiopia". *BMC Infectious Diseases* 13 (2013): 101.
14. Proceedings of 2nd International Congress on Pathogens at the Human-Animal Interface (ICOPHAI): One health for sustainable development 14-17 (2013): 231.
15. Hashemi-Fesharki R. "Seroprevalence of *Toxoplasma Gondii* in cattle, sheep and goats in Iran". *Veterinary Parasitology* 61.1.2 (1996): 1-3.
16. Hassan HM., *et al.* "Seroprevalence of *Neospora caninum* and *Toxoplasma Gondii* antibodies in sheep and goats in Egypt". *Journal of the Egyptian Veterinary Medical Association* 60: 19-24.
17. Huong LT., *et al.* "Prevalence of antibodies to *Neospora caninum* and *Toxoplasma Gondii* in cattle and water buffalos in southern Vietnam". *Veterinary parasitology* 75.1 (1998): 53-57.
18. Ibrahim AM and Abakar AD. "Human Toxoplasmosis in the Sudan: A Review". *EUROPEAN ACADEMIC RESEARCH* 3.6 (2015): 6890-6904.
19. Ibrahim A.M., *et al.* "Area-wide Detection of Anti-*Toxoplasma Gondii* Antibodies in Dairy Animals from the Khartoum State, Sudan". *Journal of life sciences* 8.9 (2014): 723-730.
20. Ibrahim AM., *et al.* "Seroprevalence and Analysis of Some Risk Factors Associated with Human Toxoplasmosis among HIV Patients Attending Basher University Teaching Hospital, Sudan". *EUROPEAN ACADEMIC RESEARCH* 3.6 (2015): 2615-6198.
21. Innes EA. "Neosporosis and toxoplasmosis in farmed livestock: Options for control. Proceedings of European Buiatrics Forum, Palias de Faro Marseille (2011): 7-15.
22. Khalil MK and Elrayah IE. "Seroprevalence of *Toxoplasma Gondii* antibodies in farm animals (camels, cattle, and sheep) in Sudan". *Journal of Medicine and Animal Health* 3.3 (2011): 36-39.

Citation: Shadia Ahmed M Lazim., *et al.* "Seroprevalence of *Toxoplasma Gondii* in cattle, Sheep and Goats from River Nile State, Sudan". *Multidisciplinary Advances in Veterinary Science* 2.2 (2018): 332-337.

23. Malik MA., *et al.* "Toxoplasmosis in sheep in Northeastern United States". *Journal of the American Veterinary Medical Association* 196.2 (1990): 263-265.
24. Nematollahi A and Moghaddam G. "Survey on Seroprevalence of anti-Toxoplasma Gondii antibodies in cattle in Tabriz, Iran by IFAT". *American Journal of Animal and Veterinary Sciences* 3.1 (2008): 40- 42.
25. Ortega-Mora LM., *et al.* "Protozoal Abortion in Farm Ruminants, Guide lines for Diagnosis and Control". CAB International, London, UK (2007).
26. Ragozo AMA., *et al.* "Isolation of Toxoplasma Gondii from goats from Brazil". *Journal of Parasitology* 95.2 (2009): 323-326.
27. Slifko TR., *et al.* "Emerging parasite zoonosis associated with water and food". *International Journal for Parasitology* 30.12.13 (2000): 1379-1393.
28. Smith JL. "Documented outbreaks of toxoplasmosis: Transmission of Toxoplasma Gondii to humans". *Journal of Food Protection* 56.7 (1993): 630-639.
29. Taylor MA., *et al.* *Veterinary Parasitology*. Third Edition, b- Blackwell Publishing (2007): 121-258.
30. Tenter AM., *et al.* "Toxoplasma Gondii from animal to humans". *International Journal for Parasitology* 30.12.13 (2000): 1217-1258.
31. Weiss LM and Kim K. "Toxoplasma Gondii, the Model Apicomplexan-Perspective and Methods". *Elsevier Ltd* (2007).
32. Zein Eldin EA., *et al.* "A serological Survey for Toxoplasma antibodies in cattle, sheep, goats and camels (Camelus dromedaries) in the Sudan". *Revue d'élevage et de médecine vétérinaire des pays tropicaux* 38.3 (1985): 247-249.

Submit your next manuscript to Scientia Ricerca Open Access and benefit from:

- Prompt and fair double blinded peer review from experts
- Fast and efficient online submission
- Timely updates about your manuscript status
- Sharing Option: Social Networking Enabled
- Open access: articles available free online
- Global attainment for your research

Submit your manuscript at:

<https://scintiaricerca.com/submit-manuscript.php>