

Original Research Article

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## Association Between Toxoplasmosis in Cats and FeLV, FIV in Kuwait State

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### ABSTRACT

#### Keywords

Toxoplasmosis, immunosuppression, parasitic disease, mammals, lymphoid neoplasia

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This study conducted in Animal House Veterinary Hospital Salymia region, Kuwait state and its focuses on the domestic cats because of the majority of families in Kuwait have cats and other pets in their homes and this importance reflected on the Public health, especially in the zoonotic disease. The blood samples were collected monthly from the cats that visited the hospital at the rate of 10 to 15 blood samples per month in different age, sex, and breed and the blood were collected from cephalic vein and its placed in Plain tube and it was stored at -20C until the analysis time in Animal House Veterinary Hospital Laboratory. Immunochromatography assay was used for determination of anti-*Toxoplasma gondii* specific IgG, IgM and Virology to detect *Feline leukemia virus (FeLV)* Antigen and Feline Immunodeficiency virus antibody detection in serum samples. The obtained result of a 120 samples was, 37 cats infected by *T.gondii* (IgM) with sero-prevalence rate 30.8%, 72 cats infected by *T.gondii* (IgG) with sero-prevalence rate 60%, the total sero-prevalence rate of *T.gondii* (IgM, IgG) was 109(90.8%), 18 cats sero-positive for *FeLV* with sero-prevalence rate 15% and 31 cats sero-positive for *FIV* with sero-prevalence 25.8%. Nowadays the majority of families in Kuwait have cats as a pet this study provide more information about the risk of Toxoplasmosis for the public health in Kuwait state.

### Introduction

Toxoplasmosis is a disease causes by the single-celled parasite *Toxoplasma gondii (T.gondii)* it is one of the most common parasitic disease that's infects nearly all warm blooded animals including pets and humans. Although wild and domestic cats are a necessary parts of the life cycle of the *T.gondii*, and the parasite is rarely

causes clinical signs for the host, while the *T.gondii* seldomly causes significant symptoms in healthy adults it has been suggested that immunosuppression, resulting from lymphoid neoplasia, long term corticosteroids therapy, the infection with *feline immunodeficiency virus (FIV)* or *feline leukemia virus (FeLV)*, might play a role in increase prevalence of enteric coccidian parasite infection (Akhtardanesh *et al.*, 2010; Dorny *et al.*, 2002;

Lee *et al.*, 2000). *Toxoplasma gondii* is of major importance in public health, it is recognized that the main source of infection for humans is related to consumption of meat and less to the oocysts (Lopes *et al.*, 2008) to be over 79 million in 2011 and growing (Stutzer and Hartmann, 2012) moreover, stray cats maintain a permanent infection pressure upon domestic cats that have a access to the outdoor (Miro, *et al.*, 2004; Spada *et al.*, 2012).

Toxoplasmosis in cats is a threat for both animals such as mammals and humans health, *T.gondii* oocysts pass into the environment from the infected cats and acts as significant source of infection.

Cats are the main source of *T.gondii* oocysts in urban environment and information on the prevalence of exposure in cats is useful for assessing the environmental contamination by the protozoan (Dubey *et al.*, 2010), the present study was conducted to identify the toxoplasmosis in domestic cats and correlation between seropositivity to *FeLV*, *FIV* and *T.gondii* IgG and IgM and the degree of the hazard to the public health in Kuwait.

## Materials and Methods

### Study Area

The samples collected from Animal House Veterinary Hospital Salyimia region, Kuwait state.

### Laboratory Analysis

### The Samples Collection

Blood samples collect from cephalic vein from each cat and placed in tube without anticoagulant for separation of serum to make the examinations or stored at -20C until the suitable time for the examination.

### The Immunochromatography assay

The determination of anti-*Toxoplasma gondii* specific IgG, IgM antibodies were detected by Immunochromatography assay (BIONOTE, Republic of Korea), procedures given by the manufacturer's instructions were followed carefully.

## Virology Examination

Immunochromatography assay was used to test the presence of Feline Immunodeficiency virus (FIV) antibody and for feline leukemia Virus Antigen (FeLV)(BIONOTE, Republic of Korea)detection in the serum samples. Procedures given by the manufacturer's instructions were followed carefully.

## Data collection and analysis

The obtained data were analysis with SPSS 24 software.

## Results and Discussion

Toxoplasmosis in cats is a threat for both animals such as mammals and human health. *T.gondii* oocysts pass in to the environment from the infected cats and acts as significant source of infection. Cats are the main source of *T.gondii* oocyst in urban environment and information on the prevalence of exposure in cats is useful for assessing the environmental contamination by the protozoan (Dubey, 2010).

It has been suggested that the immune-suppression resulting from lymphoid neoplasia, corticosteroid therapy, the infection with feline immunodeficiency virus(FIV), or feline leukemia virus (FeLV), might play a role in increase prevalence of enteric coccidian infection (Dorny *et al.*, 2002; Lee *et al.*, 2000; Akhaterdanesh *et al.*, 2010).

The present study is first study in domestic indoor cats in Kuwait and indicated that the sero-prevalence rate of *Toxoplasma gondii* (IgM, IgG) were 38(31.6%) and 72(60%) respectively, the sero-prevalence rate of *T.gondii* in this study was high 110(91.6%),all cats included in this study were domestic indoor cats lived in single-cat households and multi –cat households as well as catteries, compared with the previous study of stray cats in Kuwait that reported low prevalence rate of *T.gondii* (IgG) sero-positivity was 19.6% (Nadra *et al.*, 2013).

The present study showed that high sero-prevalence of *T.gondii* (IgM) with contact with stray cats 34(89.47%), and high sero-prevalence of *T.gondii* (IgG) with contact with stray cats 69(95.83%), also high sero-prevalence of FIV with contact with stray cats 30(96.77%), further high sero-prevalence rate of FeLV with contact with stray cats

17(94.44%), the sero-prevalence rate of *T.gondii* (IgM, IgG) and retroviruses FIV and FeLV were significantly different with contact with stray cats in univariate analysis (chi-square  $-P<0.05$ ), so contact with stray cats increase the risk of infection by *toxoplasmosis* and *retroviruses* (FIV, FeLV).

While there was no significant difference between the sero- prevalence of *T.gondii* (IgM, IgG) and *retroviruses* FIV and FeLV with contact with stray cats in multivariate analysis(binary logistic regression) so there was no correlation between sero-prevalence of *T.gondii* (IgM, IgG) and *retroviruses* (FIV, FeLV)  $P>0.05$ .

The study represented that high sero-prevalence rate of *T.gondii* (IgM) with repeated infection was 11(28.95%), high sero-prevalence rate of *T.gondii* (IgG) with repeated infection 29(40.28%), high sero-prevalence rate of *retroviruses* FIV and FeLV with repeated infection 17(58.83%) and 12(66.67%). The sero-prevalence of *T.gondii* (IgM, IgG) and *retroviruses* (FIV, FeLV) were significantly different with repeated infection in univariate analysis (chi-square- $P<0.05$ ).so there were significant relation between the sero-prevalence rate of *T.gondii* (IgM, IgG) and *retroviruses* (FIV, FeLV) and repeated infection. In multivariate analysis (binary logistic regression) there were significant different between the sero-prevalence of *retroviruses* (FIV, FeLV)  $P<0.005$ , while there were no significant different between sero-prevalence of *T.gondii* (IgM, IgG) and repeated infection  $P>0.05$ , so there were association between the sero-prevalence rate of retroviruses and repeated infection.

The study illustrated that low sero-prevalence of *T.gondii* (IgM) with prolonged used of corticosteroids 0(0%), high sero- prevalence rate of *T.gondii* (IgG) with prolonged used of corticosteroids 15(20.83%), high sero-prevalence rate of FIV with prolonged used of corticosteroids 5(16.13%), high sero-prevalence rate of FeLV with prolonged used of corticosteroids 9(50%).

The sero-prevalence rate of *T.gondii* (IgM, IgG) and *retroviruses* (FIV, FeLV) were significantly different

with prolonged used of corticosteroids in univariate analysis (chi-square  $-P<0.05$ ). The sero-prevalence rate of *T.gondii* (IgG) and FeLV were significantly different with prolonged used of corticosteroids in multivariate analysis (logistic regression  $P<0.05$ ). So there were association between sero-prevalence of *T.gondii* (IgG) and *retrovirus* FeLV and prolonged used of corticosteroids.

The study demonstrated that low sero-prevalence of *T.gondii* (IgM) with cancer 1(2.63%), and low sero-prevalence rate of *T.gondii* (IgG) with cancer 9(12.5%), and low sero-prevalence of FIV with 2(6.45%), and high sero-prevalence of FeLV with cancer 14(77.78%). The sero-prevalence rate of *T.gondii* (IgM, IgG) and *retroviruses* (FIV, FeLV) were significantly different with cancer in univariate analysis (chi-square- $P<0.05$ ).

The sero-prevalence of *T.gondii* (IgM) and *retrovirus* FeLV were significantly different with cancer in multivariate analysis (logistic regression  $-P<0.05$ ), so there were association between sero-prevalence of *T.gondii* (IgM) and FeLV with cancer.

The outcome results of *Toxoplasmosis* sero-prevalence rate (IgM, IgG) represent that the exposure to *T.gondii* in domestic indoor cats was high and these cats may play an important role in the environment contamination and public health. keep cats indoor and feed them commercial food and don't feed them raw meat further stop them from rooming outside and hunting preys as well as examined all new introducing cats for FIV and FeLV sero-positivity, further more vaccination against FIV, FeLV is available to protect the indoor cats.

Increase the awareness of the community about the risk of infection thought the consuming of raw meat and hunting prey play important role in increase the sero – prevalence rate of *T.gondii* (IgM, IgG), The concurrent retroviral sero-positivity (FIV, FeLV) were found to be associated with the increase risk for developing *Toxoplasmosis* in indoor cats.

**Table.1** Prevalence rate of *Toxoplasma gondii* (IgM, IgG) and FIV, FeLV in 120 domestic indoor cats in Kuwait.

Disease	T.gondii(IgM)	T.gondii(IgG)	FIV	FeLV
<b>+V</b>	38	72	31	<b>18</b>
<b>P.Rate</b>	31.6%	60%	25%	<b>15%</b>
<b>Total</b>	<b>110(91.6%)</b>		<b>31(25.8%)</b>	<b>18(15%)</b>

Chi-square  $\chi^2 < 60$  -  $P < 0.05^*$

The sero-prevalence rate of *T.gondii* (IgM, IgG) was 110(91.6%), and the sero-prevalence rate of FIV was 31(25.8%), the sero-prevalence rate of FeLV was 18(15%).

**Table.2** Prevalence rate of the Contact with stray cats and Repeat infection, prolonged Corticosteroids used and Cancer of infected cats by (120) by *T.gondii* (IgM, IgG) and FIV, FeLV in Kuwait.

Contact with stray cats	Disease	Positive	Negative	Prevalence rat	X2	df	Sign
	<i>T.gondii</i> (IgM)	34	4	89.47%	16.133a	1	<b>0.00*</b>
	<i>T.gondii</i> (IgG)	69	3	95.83%	4.800a	1	<b>0.28</b>
	FIV	30	1	96.77%	28.033a	1	<b>0.00*</b>
	FeLV	17	1	94.44%	58.800a	1	<b>0.00*</b>
<b>Repeat infection</b>	<i>T.gondii</i> (IgM)	11	27	28.95%	16.133a	1	<b>0.006*</b>
	<i>T.gondii</i> (IgG)	29	43	40.28%	4.800a	1	<b>0.028*</b>
	FIV	17	14	58.83%	28.033a	1	<b>0.000*</b>
	FeLV	12	6	66.67%	58.800a	1	<b>0.000*</b>
<b>Corticosteroids</b>	<i>T.gondii</i> (IgM)	0	38	0%	16.133a	1	<b>0.000*</b>
	<i>T.gondii</i> (IgG)	15	57	20.83%	4.800a	1	<b>0.028*</b>
	FIV	5	26	16.13%	28.033a	1	<b>0.000*</b>
	FeLV	9	9	50%	58.800a	1	<b>0.000*</b>
<b>Cancer</b>	<i>T.gondii</i> (IgM)	1	37	2.63%	16.133a	1	<b>0.000*</b>
	<i>T.gondii</i> (IgG)	9	63	12.5%	4.800a	1	<b>0.028*</b>
	FIV	2	29	6.45%	28.033a	1	<b>0.000*</b>
	FeLV	14	4	77.78%	58.800a	1	<b>0.000*</b>

Chi-square  $\chi^2 < 60$  -  $P < 0.05^*$

The sero-prevalence rate of *T.gondii* (IgM) and *T.gondii* (IgG) with contact with stray cats was 34 (89.47%) and 69 (95.83%). further the sero-prevalence of FIV (Anti-boodies) and FeLV (Antigen) with contact with stray cats was 30 (96.77%) and 17 (94.44%). The sero –prevalence rate of *T.gondii* (IgM, IgG) and *retroviruses* (FIV, FeLV) were significantly different with contact with stray cats ( $P < 0.05$ ), and this table also describe the prevalence rate for the *T.gondii* (IgM) and *T.gondii* (IgG) in the repeated infection was (28.95%, 40.28%), for the prolonged corticosteroids was (0%, 20.83%) and for the cancer by the values (2.63%,12.5%).

**Table.3** Describe the logistic regression there were significant difference between repeated infection and *retroviruses FIV* and *FeLV* sero-positivity (P<0.05), there were no significant difference between repeated infection and *T.gondii* (IgM, IgG) sero-positivity (P>0.05).

Contact	Disease	sig	Disease	sig	Disease	sig	Disease	sig
	<i>T.gondii</i> (IgM)	0.259	<i>T.gondii</i> (IgG)	0.193	FIV	0.388	FeLV	<b>0.838</b>
<b>Repeat infection</b>	<i>T.gondii</i> (IgM)	0.190	<i>T.gondii</i> (IgG)	0.442	FIV	0.023*	FeLV	<b>0.008*</b>
<b>Corticosteroids</b>	<i>T.gondii</i> (IgM)	0.998	<i>T.gondii</i> (IgG)	0.038*	FIV	0.838	FeLV	<b>0.000*</b>
<b>Cancer</b>	<i>T.gondii</i> (IgM)	0.04*	<i>T.gondii</i> (IgG)	0.742	FIV	0.206	FeLV	<b>0.000*</b>

**Author Contributions**

S. M. Ibrahim: Investigation, formal analysis, writing—original draft. M. A. Abdalla: Validation, methodology, writing—reviewing. I. M. F. Mohamed:—Formal analysis, writing—review and editing.

**Data Availability**

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Declarations**

**Ethical Approval** Not applicable.

**Consent to Participate** Not applicable.

**Consent to Publish** Not applicable.

**Conflict of Interest** The authors declare no competing interests.

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