The Journal of Animal & Plant Sciences, 22(1): 2012, Page: 51-53
ISSN: 1018-7081

PREVALENCE OF TOXOPLASMA GONDII ANTIBODIES IN HUMAN BEINGS AND COMMENSAL RODENTS TRAPPED FROM LAHORE, PAKISTAN.

M. S. Ahmad, A. Maqbool[*], M. Mahmood-ul-Hassan[**], M. Mushtaq-ul-Hassan[***] and A. A. Anjum[****]

Provincial Diagnostic Laboratory, Department of Livestock and Dairy Development, 16 Cooper Road, Lahore, Pakistan [*]Department of Parasitology, [**]Department of Wildlife and Ecology, [***]Department of Zoology, Govt. College University Faisalabad. [****]Department of Microbiology, University of Veterinary and Animal Sciences, Lahore Pakistan.
Corresponding author Address: Azhar2007m@yahoo.com; azhar2003@yahoo.com

ABSTRACT

An endeavor was made to assess the prevalence of *Toxoplasma* infection in humans and in rodents captured from the corresponding areas of Lahore using the Latex Agglutination Test (LAT). Sera samples of *Rattus rattus* (n=210), Mus muscular (n=90) and human beings (n=300) were screened for antibodies against *T. gondii.* Highest percentage of positive cases (58.57%) was recorded in *R.rattus* followed by *M.muscularus* (36.66%) and lowest in human beings (11.33%). Sera samples from human beings showed significant difference in relation to positive level of antibodies against *T. gondii* at different age groups. Highest percent prevalence of antibodies (28%) was observed in human sera samples collected from more than 51 years of age group followed by 41-50 years age group (17.33%). Remaining two age groups (21-30 and 31-40 years) were negative for anti-T. gondii antibodies. Anti-T. gondii antibodies were detected in sera of rodents and human beings residential of same localities. So, rodents can play role in the transmission of *T. gondii* to human beings.

INTRODUCTION

Toxoplasma gondii is an opportunist parasite that causes high morbidity and mortality in warm-blooded organism including humans. It is responsible for one of the most widespread zoonotic parasite infection usually asymptomatic in healthy individuals but may cause serious complications in immunocompromised hosts (Hill and Dubey, 2002). Among several domestic animals cat is the definite host but pigs, cattle, sheep, goats and rodents may play role in its transmission. Rats and mice are thought to be persistent wildlife host reservoirs of *T. gondii* (Glazebrook *et al.,* 1978; Webster, 1994). Considering the close interaction between livestock, rodents and human beings, study was designed to assess the presence of infection in humans and rodents of Lahore Pakistan by measuring antibodies against *T. gondii* using Latex Agglutination Test (LAT).

MATERIALS AND METHODS

Blood (10mL) without anticoagulant was collected in disposable sterilized syringes from three hundred human being residing in close association with rodents at three localities (Allama Iqbal Town, Walled city and Areas adjacent to Lahore Railway station) of Lahore, city. Rodents (Rats/mice) were trapped from same localities following the technique described by Singla *et al*., (2008).

Species of rodents were differentiated on the basis of gross morphology as mentioned by Roberts (1997). Blood sample from each rodent was collected in sterilized syringes (Benjamin, 1985). Sera were separated from blood samples in sterilized eppendorf tubes and centrifuged at 3000 rpm for twenty minutes to procure clear supernates. Properly labeled sera were stored at -20ºC until used. Sera samples of human beings were distributed in four groups on the basis of age differences. Group-1 ranged from 21 to 30 years, Group-2 from 31 to 40 years, Group-3 from 41 to 50 years and Group-4 from 51 to 60 years and above. All the serum samples were analyzed for specific IgG Toxoplasma antibodies (Samaha *et al*., 1993) using latex agglutination test (LAT). The commercial test kit "Toxoplasmosis Latex" manufactured by Quimica Clinica Aplicada, S. A. Amposta Spain was used for this purpose.

Two fold suspensions of polystyrene particles sensitized with inactivated *Toxoplasma gondii* antigens was mixed with each dilution of test serum and agglutination was observed (Topley *et al*., 1998). Sera with antibody titer equal or lower than 1:16 were considered negative and higher titers than this were positive. Percent prevalence of anti-T. gondii antibodies was determined using sera sample having titer above than 1:16 antibody titers above this indicate presence of chronic or recent infection with *T. gondii*.

RESULTS AND DISCUSSION

People aged between 51-60 years and above showed the highest antibodies against *T. gondii* (28%) followed by those aged between 41-50 years (17.33%) while rest of age groups were not positive (Table 1).

Seropositivity for rats was 58.57% whereas it was 36.66% in mice (Table 2). Significant differences in per cent prevalence were recorded among three localities included in present study both in rats at Allama Iqbal Town (42.3%), Walled city (72%) and Railway Station (60%) and mice (16.6%, 53.3% and 40%), respectively. Prevalence of *T. gondii* in human beings was lower at Allama Iqbal Town (6.0%) than in Walled City (15.0%) and Railway Station (13.0%). Overall sero-prevalence in human beings (11.3%) is much lower when compared with rats/mice of the same locality.

In present study the prevalence of anti-*T. gondii* antibodies in sera samples of rodents was 52.0 per cent (rats 58.6 and mice 36.7%) measured by LAT. Present serological data showed a much higher rate of infection in rodents in contrast with most of the cited literature on prevalence of *T. gondii* (1-30%) in various countries (Dubey and Frenkel, 1998; Franti *et al.*, 1976; Tizard *et al.,* 1978). However, our findings are comparable with those of Salibay and Claveria (2006) in Philippines. Overall prevalence reported by them was 55.5% which is a much closest number to recorded results of the present experiment. In UK, mean prevalence observed by Webster (1994) was 35%, which is three time higher rate in comparison with the previous reports. Frenkel *et al.* (1995) reported 23.3% prevalence of *T. gondii* in rats of Panama whereas only 3% was reported by Tizard *et al.,* (1978). El-Shazly *et al.* (1991) narrated 11.6% seropositive reactions for Toxoplasmosis while working on four commensal rodents in Egypt. Only 2 (0.8%) of 238 rats were found positive in Grenada, West Indies (Dubey *et al.,* 2006) through MAT.

Rate of infection of *T. gondii* as assessed by LAT during present plan of work differs from most of the figures provided in research of various scientists in different countries. It indicates that per cent prevalence of *T. gondii* infection is not consistent throughout the world and varies from one geographical area to other (Salibay and Claveria, 2006). This variation may be due to differences in hygienic status of the societies, abundance of definitive as well as intermediate hosts, population figures and feeding habits of various countries of the world. Significant differences in per cent prevalence were recorded among three localities included in present study both in rats at Allama Iqbal Town (42.3%), Walled city (72%) and Railway Station (60%) and mice (16.6%, 53.3% and 40%), respectively. Among the possible reasons for much lower rate of *T. gondii* infection at Allama Town than other two localities may be higher educational status, well mannered society, less number of stray cats/dogs and better hygienic status.

Along with rodents, stray dogs/cats, domesticated animals could be a potential source of infection transmission to human beings as well. In present study in another segment of the same experiment titer of anti-*T gondii* antibodies was checked in sera samples collected from human beings at same localities. In human beings, similar findings were recorded in relation to rate of infection at three localities of study plan as in case of rats/mice. Prevalence of *T. gondii* was lower at Allama Iqbal Town (6.0%) than of Walled City (15.0%) and Railway Station (13.0%). Overall sero-prevalence in human beings (11.3%) was much lower when compared with rats/mice of the same localities which may be due to the lower rate of domestication of dogs/cats and proper cooking of meat for consumption in our society.

Table 1: Prevalence of anti-*Toxoplasma gondii* antibodies in sera collected from different age groups of humans by Latex agglutination test (LAT).

Age Groups (Years)	Number of idividuals	Antibody titer reciprocal			Sero-positive	% Sero-positive
		1:64	1:128	1:256		
G-1 (21-30)	75	0	0	0	0	0
G-2 (31-40)	75	0	0	0	0	0
G-3 (41-50)	75	7	6	0	13	17.33
G-4 (51-60 & above)	75	7	8	6	21	28
Total	300	14	14	6	34	11.33

Table 2: Distribution of anti-Toxoplasma antibodies in sera of *Rattus rattus* and *Mus muscularis* trapped from different localities by Latex agglutination test (LAT).

Groups	No. Examined	Antibody titer			Seropositive	% Seropositive
		1:64	1:128	1:256		
Rats	210	12	47	64	123	58.57
Mice	90	3	12	18	33	36.66
Total	300	15	59	82	156	52

Anti-*T. gondii* antibody titers were calculated in sera samples collected from human beings by dividing in four age groups (21-30, 31-40, 41-50 and 51-more). Antibodies were detected only in last two groups (17.3% and 28%) and none in first two. The seroprevalence was much higher in adults as compared to young human beings. This variation in results may be due to the difference in environmental conditions, immune status of the individuals, socio-cultural differences, host age and topography as suggested by Yamaoka and Konishi (1993) and Dubey and Beattie (1988). Frenkel *et al.* (1995) observed 12.6% cumulative incidence of Toxoplasmosis in sera samples of human beings using direct agglutination test and is consistent to our results.

Fan *et al.* (1998) reported two times higher prevalence (21.8%) than our findings while working in Taiwan. Their suggestions in relation to age are in accord with our results. The rate of infection is higher at old age in comparison with young ones. Higher rates of seropositivity had also been reported by other workers such as Dubey and Frenkel (1998), Tadahisa *et al*. (2000) and Bobic *et al.* (1998). In each group, seropositivity tended to increase with age of the subjects.

The wide range of titers observed in rats/mice and human beings in present study are indicative of differences in the persistence of *T. gondii,* possibility of acute or chronic infection, re-exposure and geographical region. However, observations of the present study strongly suggest that the rodents are among one of the major reservoirs of *T. gondii* infection. Close association with rodents, domesticated/stray dogs/cats, poor hygiene, awareness and poverty are major contributing factors responsible for persistent and rise in prevalence of *T. gondii* in any geographical are as well as society.

REFERENCES

Benjamin, M. M. (1985). Outline of veterinary clinical pathology. 3rd ed. The Lowa State University Press. Ames U.S.A. pp: 48-63.

Dubey, J. P. and J. K. Frenkel. (1998). Toxoplasmosis of rats: a review, with considerations of their value as an animal model and their possible role in epidemiology. Vet. Parasitol. 77:1-32.

Dubey, J. P., M. I. Bhaiyat, C. N. Macpherson, C. Allie, A. Chikweto, O. C. Kwok and R. N. Sharma. (2006). Prevalence of *Toxoplasma gondii* in rats (*Rattus norvegicus*) in Grenada, West Indies. J. Parasitol. 92:1107-8.

El-Shazly, A. M., S. A. Romia, G. A. El Ganayni, A. A. Abou-Zakham and T. A. S. Morsy. (1991). Antibodies against some zoonotic parasites in commensal rodents trapped from Dakahlia Governorate, Egypt. J. Egypt Soc. Parasitol. 21:169-77.

Franti, C. E., H. P. Riemann, D. E. Behymer, D. Suther, J. A. Howarth, and R. Ruppanner. (1976). Prevalence of *Toxoplasma gondii* antibodies in wild and domestic animals in northern California. J. American Vet. Asso. 169: 901–906.

Frenkel, J. K., K. M. Hassanein, R. S. Hassanein, E. Brown, P. Thulliez, R. Q. Nunez. (1995). Transmission of *Toxoplasma gondii* in Panama City, Panama: a five-year prospective cohort study of children, cats, rodents, birds, and soil. Am. J. Trop. Med. Hyg. 53(5):458-468.

Glazebrook, J. S., R. S. Campbell, G. W. Hutchinson and N. D. Stallman. (1978). Rodent zoonoses in North Queensland: the occurrence and distribution of zoonotic infections in North Queensland rodents. Aust. J. Exp. Biol. Med. Sci. 56:147-56.

Hill, D., and Dubey J. P. (2002). *Toxoplasma gondii*: transmission, diagnosis and prevention. Clin. Microbiol Infect. 8:634-40.

Roberts, T. J. (1997). The Mammals of Pakistan. 2nd Ed. Oxford University Press, Oxford, UK.

Salibay, C. C., and F. G. Claveria. (2006). *Toxoplasma gondii* infection in Philippines *Rattus* spp. Conformed through bioassay in *Mus musculus.* Vet. Arhiv. 76: 351-361.

Samaha, H. A., E. L. Goharh and A. A. Draz. (1993). Toxoplasmosis, Balantidiasis and Amebiasis among zoo animals and man. Assiut. Vet. Med. J. 29:129-135.

Singla, L. D., N. Singla, V. R. Parshad, P. D. Juyal, N. K. Sood. (2008). Rodents as reservoirs of parasites in India. Integrative Zoology. 3: 21-26.

Tizard, I. R., J. Harmeson and C. H. Lai. (1978). The prevalence of serum antibodies to *Toxoplasma gondii* in Ontario mammals. Can. J. Comp. Med. 42: 177-83.

Topley, W., C. Lesilie, B Albert and S Max. (1998). Microbiology and microbial infection. 9th Ed. Vol. 1, Arnold, Co. London (UK). Pp. 957-958.

Webster, J. P. (1994). Prevalence and transmission of *Toxoplasma gondii* in wild brown rats, *Rattus norvegicus*. J. Parasitol. 108: 407-11.