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Risk factors for *Toxoplasma gondii* infection in Kohat District, Pakistan

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ABSTRACT

Toxoplasma gondii is a widespread zoonotic parasite that is the causative agent for toxoplasmosis in human and completes its life cycle in separate hosts. Considering the significance of the infection, the current study was designed to assess various risk factors for the parasite transmission to human in Kohat District, Pakistan. A total of 122 suspected individuals were asked to fill pre-designed questionnaire. A total of 44 (36.07%) individuals were found to be infected with *Toxoplasma gondii*. Handling pets and birds, untreated water, unpasteurized milk and undercooked meat were found to be associated with infection. Raw vegetables and blood transfusion were not found to be associated with infection in our study. Thus, it can be concluded that *Toxoplasma gondii* is a prevalent zoonotic agent in Kohat, Pakistan and various prophylactic measures like hand washing, cooking meat properly, wearing gloves while contacting pets and birds, treating water and pasteurizing milk will be very helpful to reduce disease burden in the study area.

1. Introduction

Toxoplasma gondii (*T. gondii*) is a common zoonotic parasite that was first discovered in the tissues of a rodent, *Ctenodactylus gundi*, by Tenter *et al.*[1]. It is a protozoan parasite belonging to phylum Apicomplexa, subclass Coccidiasina and family Sarcocystidae[2]. It is distributed worldwide ranging from arctic region to hot deserts[3]. Most mammalian species are vulnerable to infection and may act as intermediate host where the parasite completes asexual phase

of its life cycle. The sexual phase of *T. gondii* is completed in the digestive epithelium of cats which act as a definitive host[4]. It is the causative agent for toxoplasmosis in human and it is estimated that almost 1/3 of the world's population is infected, with most of cases being asymptomatic[2]. Considering the significance of the pathogen and lack of scientific data in the region, the current study was conducted to assess the risk factors of *T. gondii* in Kohat District, Pakistan.

2. Materials and methods

A questionnaire-based study was carried out between May to July at Kokilaben Dhirubhai Ambani (KDA) Hospital, Liaquat Memorial Hospital (LMH), Family Health Hospital and private laboratories in Kohat District, Pakistan. A total of 122 suspected individuals were asked to fill pre-designed questionnaire and informed consent was

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The study protocol was performed according to the Helsinki declaration and approved by Departmental Ethics Committee at the Department of Zoology, Kohat University of Science and Technology, Pakistan, according to the Helsinki Convention World Medical Association. Informed written consent was obtained from all tested individuals.

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obtained from them.

3. Results

Data were collected from KDA Hospital, LMH, Family Health Hospital and private laboratories in Kohat District, Pakistan. In KDA Hospital, 15 cases were studied among which 4 (26.67%) cases were positive and 11 cases (73.33%) were negative; in Liaquat Memorial Hospital (LMH), 6 cases were studied among which no cases (0.00%) were positive and 6 cases (100.00%) were negative; in Family Health Hospital, 95 cases were studied among which 38 (40.00%) cases were positive and 57 (60.00%) cases were negative and in private laboratories, 6 cases were studied among which 2 (33.33%) cases were positive and 4 (66.67%) cases were negative. Total 122 cases were studied among which 44 (36.07%) cases were positive and 78 (63.93%) cases were negative.

Risk factors of toxoplasmosis were detected. In pets handling, 35 cases were studied among which 15 (42.86%) were effected and 20 (57.14%) cases were not effected; in tap water, 5 cases were studied among which 2 (40.00%) cases were positive and 3 (60.00%) cases were negative; in well water, 16 cases were studied among which 7 (43.75%) cases were effected and 9 (56.25%) cases were negative; in undercooked meat, 7 cases were studied among which 2 (28.57%) cases were effected and 5 (71.43%) cases were found safe; in contaminated vegetables, 3 cases were studied and there was no risk of toxoplasmosis 0 (0.00%) and 3 (100.00%) cases were negative; in birds, 15 cases were studied and the risk of toxoplasmosis were 5 (33.33%) and 10 (66.67%) cases were not risky; in unboiled milk, blood transfusion, disposal of pet faeces with hand, use of unwashed gloves for pet, 6, 9, 17, 9 cases were studied among which 1 (16.67%), 0 (0.00%), 10 (58.82%), 5 (55.56%) were positive and 5 (83.33%), 9 (100.00%), 7 (41.18%), 4 (44.44%) were negative respectively. In all of these, the pet handling and disposal of pet faeces with hand had more chance for toxoplasmosis with respect others selected risk factors of toxoplasmosis which 44 (36.07%) were infected and 78 (63.93%) were not affected out of these 122 cases of toxoplasmosis.

4. Discussion

Toxoplasmosis is an infection disease caused by a unicellular parasite called *T. gondii*. The infection is widely acquired from contacting with cats and their feces or with raw or undercooked meat. Out of the 122 study individuals, 44 (36.07%) individuals were found to be infected with *T. Gondii*. Out of the 35 respondents involved in pet handling and 15 individuals handling birds, 15 (42.86%) and 5 (33.33%) individuals, respectively, were found to be positive for infection. Out of 17 individuals who disposed pet faeces with hand, 10 (58.82%) individuals were found positive for infection. Blood transfusion and raw vegetables were not found to be risk factors for infection in our study. Out of the 5 individuals consuming tap water and 16 individuals consuming well water, 2 (40%) and 7 (43%) individuals were positive

for *T. Gondii*. Out of the 6 respondents who used unboiled milk and 7 individuals ingesting undercooked meat, 1 (16.67%) and 2 (28.57%) individuals, respectively, were found to be positive for infection. The morphology of *T. gondii* was showed in this study and it can be conclude that it will be inserted easily through different in hygienic sources. Our results are in concordance with other studies that also showed that infections in human occur by consumption of untreated water, unpasteurized milk and raw or undercooked meat because these might be contaminated with oocysts[5,6]. Our studies suggest that rearing pets and birds can be considered as risk factors for transmitting infection. This may be due to the fact that many species of mammal and birds may act as intermediate host for the pathogen and can aid in transmission[4]. Risk factors of toxoplasmosis are pet handling, tap water, well water, undercooked meat, contaminated vegetables, birds, unboiled milk, blood transfusion, disposal of pet faeces with hand and use of unwashed gloves. Tasting meat should be avoided during cooking. Gloves should be used while contacting pets or disposing their waste. Hand washing, boiling milk and water are also important precautionary measures to control infection. Cutting board, knives and other utensils that come in contact with uncooked meat should be thoroughly washed. Meat should be exposed to extreme cold or heat to kill oocysts.

It can be concluded that *T. gondii* is a prevalent zoonotic agent in Kohat, Pakistan and various prophylactic measures should be taken to prevent the incidence of the disease.

Conflict of interest statement

We declare that we have no conflict of interest.

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