



## Original Article

# Study on Seroprevalence of IgG antibody of *Toxocara canis* in Unexposed People in Sylhet

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### Abstract:

*Toxocara canis* (*T. canis*) is a widespread gastrointestinal nematode parasite of dog and a causative agent of zoonotic disease in human known to produce three recognized clinical entities, i.e. visceral larva migrans, ocular larva migrans and covert toxocariasis. The aim of this study was to see the seroprevalence of IgG antibody of *T. canis* in unexposed people. Blood samples from 90 people in Sylhet who are unexposed to dog be obtained to determine the presence of antibodies to *T. canis*. The sera were tested by ELISA method. Demographic data regarding age, gender, residence, socio-economic status, contact history with dog and also having pet dog at home or neighborhoods were collected by questionnaire. All results were evaluated statistically using the Chi-square and one way ANOVA test. Seroprevalence rate was 37.80%. Seroprevalence rate of IgG antibody of *T. canis* in unexposed people are statistically significant ( $p < 0.05$ ) in Chi-square test. Seropositivity were related to age, gender, residence, socioeconomic status and contact history with dog. High seropositivity of *T. canis* suggests infection by the organism and presence of Toxocariasis in our country. *T. canis* can cause severe illness which can be cured by anti-helminthic, antiprotozoal treatment. Its high prevalence in this study warrants greater awareness among clinicians so that they can suspect the disease on clinical grounds and either send them for diagnostic evaluation or initiate empirical treatment. A large scale multilevel study is needed to get a clear picture of seropositivity of *T. canis* infection in every region of Bangladesh. Additional public health measures to prevent dog exposure should be explored in this high risk population and further studies are needed to confirm and extend the seroprevalence findings.

**Key words:** *Toxocara canis*, IgG antibody, Toxocariasis

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### Introduction:

*Toxocara canis* (*T. canis*) is a widespread gastrointestinal nematode parasite of dog and a causative agent of zoonotic disease in human<sup>1,2,3</sup>. *T. canis* is also known as dog roundworm. *T. canis* is known to produce three recognized clinical entities, i.e. visceral larva migrans<sup>4</sup>, ocular larva migrans<sup>5</sup> and covert toxocariasis<sup>6</sup>. In 1950, Campbell-Wilder was the first to describe toxocariasis in humans; she published a paper describing ocular granulomas in patients with endophthalmitis, coasts disease, or pseudoglioma. Two years later, Beaver *et al.* published the presence of *T. canis* larvae in granulomas removed from patients with symptoms similar to those in Wilder's patients<sup>3,7</sup>.

Usually *T. canis* is transmitted to human through injection of infective eggs<sup>10,11</sup>. Many objects and surfaces can become contaminated with infectious *T. canis* eggs. Flies that feed on feces can spread *T. canis* eggs to surfaces or foods<sup>7</sup>. Young children

who put contaminated objects in their mouths or eat dirt (pica) are at risk of developing symptoms<sup>3,7,8</sup>.

Humans can also contaminate foods by not washing their hands before eating. Dogs and foxes are the reservoir for *T. canis*, but puppies and cubs pose the greatest risk of spreading the infection to humans<sup>9,11</sup>.



**Figure-1: Adult *Toxocara canis***<sup>42</sup>

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Every year about 10,000 cases of *T. canis* infection are reported in the United States and almost 14% of the US population is infected with *T. canis*, a parasite of dogs and cats that can be passed from animals to humans. In Cleveland, Ohio, the prevalence of *T. canis* infection in the cohort ages 2, 3 and 4-10 years was 2%, 12%, and 12%, respectively<sup>13</sup>. Seroprevalence is higher in developing countries, but can be considerable in first world countries, as well. In Bali, St. Lucia, Nepal and other countries, seroprevalence is over fifty percent<sup>7</sup>. Previous to 2007, the U.S. seroprevalence was thought to be around 5% in children<sup>8</sup>. However, Won *et al.* discovered that U.S. seroprevalence is actually 14% for the population at large<sup>9,12</sup>.

*T. canis* infection was also reported in other Asian countries including Pakistan, Japan, Korea, Indonesia and Malaysia<sup>4,15,16,17,18</sup>. In Nepal, another nearest country of Bangladesh, a high seroprevalence rate (81%) was observed among the people of Kathmandu<sup>19</sup>. *T. canis* infections are more likely to be a hazard for people exposed to contaminated environments. This seemed to be confirmed in a survey by Woodruff among two British dog breeders that showed a significantly higher degree of infection (15.7% ELISA positive) compared with 922 healthy adult controls (2.6% positive)<sup>20</sup>. In other studies in which animal hospital employees, kennel workers and cat breeders were involved, no serological evidence of an increased risk could be established<sup>21,22,23</sup>. The suggested explanation was the reasonable standard of personal hygiene by the personnel.

Adequate research has not been conducted on Toxocariasis in Bangladesh. Some seroprevalence study of *T. canis* was carried out in India where total seroprevalence of *T. canis* antibodies in children of Kashmir valley was 32.86%<sup>24</sup>. In different parts of the world, serological studies have demonstrated a variation in *T. canis* seroprevalence ranging from 2.3% to 86%<sup>25,26</sup>. However that study showed a higher rate of infection (32.86%) than that of (6.4%) subjects residing in a rural area near Chandigarh, Slovak Republic which may be due to low standards of hygiene, frequent contact with the contaminated soil and less paternal education<sup>25,27</sup>. All the epidemiological information quoted in relation to *T. canis* infection in human so far has been derived from studies carried out in developed countries and some developing countries except Bangladesh.

In Bangladesh, few research has been conducted on animals<sup>28,29</sup> but still no seroprevalence studies in any region of our country people has ever been attempted. So, the incidence is still not known. Considering the presence of huge number of dog population and different influencing factors like dog and cat ownership, lack of knowledge regarding

personal and social hygiene, fecal contamination of drinking water, soil, and park in the city and urban area, it is assumed that in Bangladesh probability is very high of *T. canis* infection to occur.

This study is undertaken to ascertain the seroprevalence of *T. canis* infection in unexposed people in Sylhet and to define associated risk factors in the unexposed group.



**Figure-2: Ocular toxocariasis<sup>41</sup>**

### **Materials and Methods:**

The study design was cross sectional, conducted in the department of Microbiology at Sylhet MAG Osmani Medical College, Sylhet from July 2012 to June 2013. Study variable were IgG antibody of *T. canis*, age, sex, residence, socioeconomic status, chorioretinitis and contact with pet dog. People who have given history of contact with dog are operationally defined in this study as exposed. Such as domesticated dog (having pet dog at home), Semi domesticated dog (dogs that freely live near home and its living conditions as well as its breeding are partially controlled by people of that home) and dog of neighborhoods (domestic or semi domesticated dog is present at neighborhoods with which people often come in contact during sharing of social activities, for example children playing at neighborhood).

On the other hand people who have given no history of contact with dog are operationally defined as unexposed. Such as Semi domesticated dog or dogs of neighborhood and domesticated (having pet dog at home but they were strictly prohibited to come in contact and maintained by servants or another member of family in an isolated place).

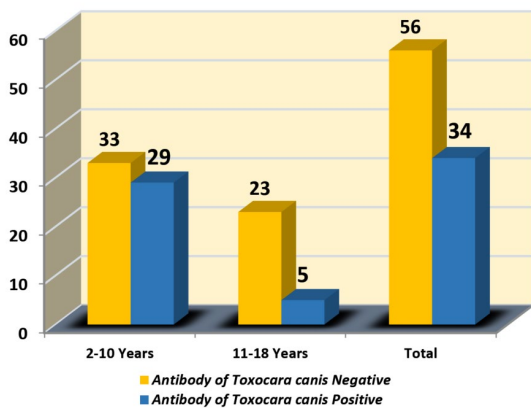
A total number of 90 (Ninety) unexposed people related to *T. canis* infection were studied. Sample was collected from both indoor and outdoor patients of Department of Paediatrics and Department of Ophthalmology, Sylhet MAG Osmani Medical College, Sylhet. All information as per questionnaire were taken. Informed written consent was obtained from parents/ guardians of all participants. Ethical permission was obtained from the ethical review committee of Sylhet MAG Osmani Medical College beforehand. All the ethical committee guidelines were followed during the conduction of the study.

Serum IgG antibodies against *T. canis* was measured by the ELISA method for the detection of IgG antibodies to *T. canis* in human serum.

All data were checked and were analyzed with the help of SPSS (Statistical Package for Social Science) with ver. 20 by using the Chi-square and One way ANOVA test.

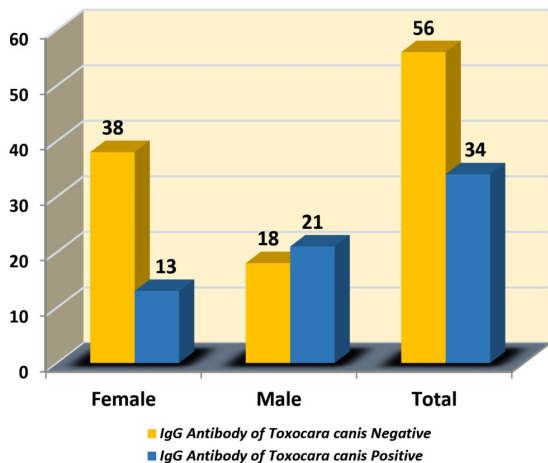
**Results:**

Age range of the population was 2 to 18 years who were divided into two groups, 2 to 10 years and 11-18 years. In unexposed individuals the seropositivity rate for the age group of 11-18 years was 17.9% (5 out of 28) where for the age group of 2-10 years of age showed higher seropositivity 46.8% (29 out of 62).



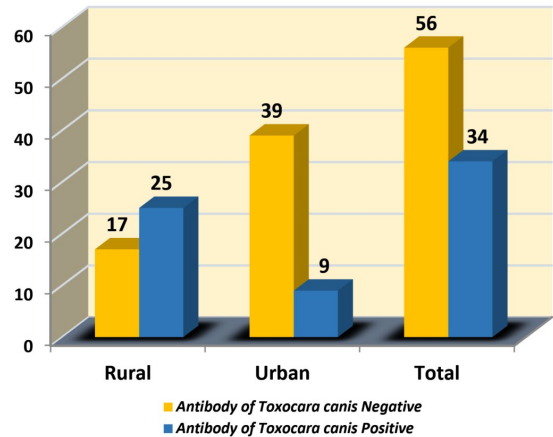
**Figure-3: Age distribution of unexposed people**

Among the unexposed people seropositivity of IgG antibody of *T. canis* in gender distribution is also statistically significant ( $p < 0.05$ ) in Chi-square test, showing a male predominance.



**Figure-4: Gender distribution of the unexposed people**

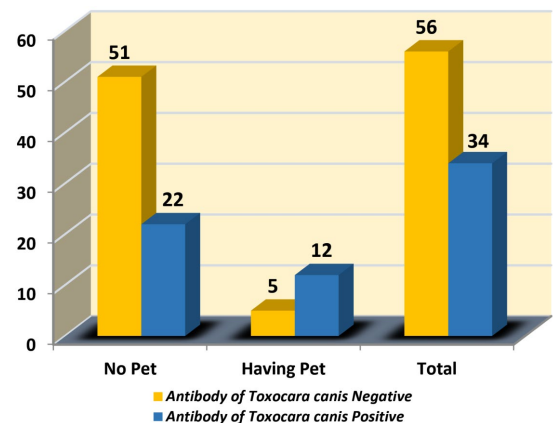
Among 90 unexposed people seropositivity of IgG antibody of *T. canis* in residence distribution is also statistically significant ( $p < 0.05$ ) in Chi-square test, showing a rural predominance 25 (59.5%).



**Figure-5: Distribution of serological results by the residence of unexposed population**

Among 90 unexposed people the seropositivity rate of lower class is 20 (52.6%) higher than middle class 13 (28.9%) and high class 1 (14.3%). One way ANOVA test was done among these three classes of people. In unexposed group significant difference was observed between lower class and middle where  $p$  value is  $< 0.05$  also lower class with high class at the 0.05 level.

Among 90 unexposed people, 73 person has given history of having no pet dog (domestic) and rest 17 person has given history of having pet dog at home but they were strictly prohibited to come in contact and maintained by servants or another member of family in an isolated place. Seropositivity for IgG antibody of *T. canis* among those having pet was higher 70.6% (12 out of 17) than those having no pet 30.1% (22 out of 73).



**Figure-6: Distribution of serological results by the contact with pet dog of unexposed people**

Among the 90 unexposed people, 39 (43.33%) were male and 51 (56.66%) were female. Seroprevalence rate was 37.80%. Seroprevalence rate of IgG antibody of *T. canis* in unexposed people is statistically significant ( $p < 0.05$ ) in Chi-square test.

### Discussion:

This was a cross sectional study conducted in Sylhet with a view to see the seroprevalence of IgG antibody of *T. canis* in unexposed people. A total of 90 persons were taken as unexposed to history of contact with dog. IgG antibody of *T. canis* were found positive in 37.80% of the respondents. No national serological survey or even study of limited scale could be traced in our country with which our data could be compared.

Among the unexposed people seropositivity of IgG antibody of *T. canis* in gender distribution is also statistically significant ( $p < 0.05$ ) in Chi-square test, showing a male predominance in unexposed male patients. This may be due to fact that males had more contact with dogs<sup>30,31</sup>.

In this study, unexposed individuals with the age group of 2-10 years showed higher seropositivity rates (46.8%) compared to the age group of 11-18 years. Young children are most at risk of infection from playing outside and placing contaminated objects and dirt in their mouths<sup>3,7,8</sup>. In Brazil, it was found that children of 5-8 years old were more likely to be positive for *T. canis*<sup>32</sup>.

Among 90 unexposed people 42 were living in rural areas of them 25 (59.5%) were seropositive whereas among the remaining 48 people living in urban areas 39 (81.2%) of them were seronegative was statistically significant ( $p < 0.05$ ) in Chi-square test. In a study of Northwestern Part of Turkey significant levels of anti-*T. canis* antibodies were detected in 73 out of 430 (16.97%) children from rural area while only one child (0.71%) had positive level of anti-*T. canis* antibodies from urban area<sup>33</sup>.

Seropositivity across three socioeconomic status among unexposed showed statistically significant difference of lower class with middle and high class.

Among 90 unexposed people the seropositivity rate of lower class is 20 (52.6%) higher than middle class 13 (28.9%) and high class 1 (14.3%). One way ANOVA test was done among these three classes of people where significant difference was observed between lower class and middle where p value is  $< 0.05$  also lower class with high class at the 0.05 level. Socio-economic level is a factor that influences *T. canis* seroprevalence<sup>34,35</sup>. While some studies report that *T. canis* seroprevalence increases with low socio-economic status<sup>31,36,37,38</sup>, there are others which claim that it does not change<sup>39,40</sup>.

In 90 unexposed individuals the seropositivity rate for those having pet was 70.6% whereas for those having no pet seropositivity rate was 30.1%. Some authors reported a higher frequency of infection for individuals who maintained contact with dogs<sup>40</sup>.

### Conclusion:

*T. canis* is a widespread gastrointestinal nematode parasite of dog and a causative agent of zoonotic disease in human known to produce three recognized clinical entities, i.e. visceral larva migrans, ocular larva migrans and covert toxocariasis. The aim of this study was to see the seroprevalence of IgG antibody of *T. canis* in unexposed people. The questionnaires were evaluated to investigate the effects of factors that might increase the risk for the acquisition of the infections, e.g. age, gender, residence, socioeconomic status, contact history with dog and also having pet dog at home or Niebuhr hood. The high seroprevalence rate (37.80%) in this study suggests the presence of *T. canis* infection in Bangladesh and the statistically significant association of above risk factors with the serological status of *T. canis* also suggests calls for more clinical awareness among the stakeholders.

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