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Original Article

Seroprevalence of Toxocariasis in Children in Kashmir, J&K State, India

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Abstract

Background: Toxocariasis is a zoonotic disease caused by the ascarid of dogs and cats, the main representative of which is a *Toxocara canis*. Distribution of the disease is world wide and is more prevalent in children. The present study was carried out in children of Kashmir valley, to determine the toxocariasis seropositivity.

Methods: For the present seroepidemiological study, blood samples were collected at random from children of all the six districts of the Valley. The sampling was carried from Jan 2004 to Dec 2005. A total of 286 children, 162 males and 124 females in age group of 0-16 years were selected for the present study. ELISA was used for detection of IgG antibodies against *Toxocara* excretory secretary antigen. A questionnaire interview was conducted to obtain the data concerning their age, sex and habits. The particular points in the questionnaire asked were recorded on the format right on the spot.

Results: Gender was found a significant risk factor for the *Toxocara* infection in children population. Male children were found more infected (41.97% as compared to females (20.94%). The total seroprevalence of *T. canis* antibodies in children of Kashmir valley was 32.86 %. The risk factors that were found associated with the infection of toxocariasis in children population of Kashmir valley include family back ground, status of living conditions, awareness, etc.

Conclusion: The present study reveals high prevalence of *T. canis* infection in children of Kashmir valley. It is important to raise the awareness of health professionals, public and educators to the fact that toxocariasis is a public health problem. Health promotion by means of a school based educational approach, diagnosis and continuous programme of treatment are necessary.

Keywords: Seroprevalence, Toxocariasis, Children, Kashmir

Introduction

Toxocariasis is a zoonotic disease caused by the ascarid of dogs and cats and the main representative of which is a *Toxocara canis* (1). The eggs of *T. canis* are unembryonated when passed in the faeces of dogs into the environment. Under optimal temperature and humidity the eggs develop into embryonated eggs that are infective to both final and paratenic hosts. Infective eggs are reported to survive optimal circumstances for at least one year. Human may acquire the infection by oral ingestion of infective *Toxocara* eggs from contaminated soil (sapro-zoonosis) from unwashed hands or consumption of raw vegetables.

The disease manifests itself as two distinct forms, visceral larva migrans (VLM) and ocular larva migrans (OLM). The signs and symptoms of VLM vary from an asymptomatic state with mild eosinophilia to a severe and poten-

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tially fatal disorder including hepatomegaly, hyperglobulinemia, pneumonitis and neurological disorders (2). The disease has a chronic state and the symptoms can even persist for more than a year. Patients with OLM also show variable clinical signs varying from asymptomatic state to acute lesions including endophthalamitis accompanying loss of vision and mass similar to retinoblastoma (3-5).

Distribution of the disease is world wide and is more prevalent in children. There is no definitive method in diagnosing *Toxocara* infection. As the larvae of *T. canis* are arrested in the paratenic host-larvae during migration and they do not mature into adults, hence a stool examination of the patient will not give any clue about the infection. However numerous studies have shown that immunoassay for detection of antibodies using a purified excretory-secretory antigen from the larval stage significantly improves sensitivity and specificity compare to assays using crude antigens (6, 7). The most widely used test, because of its high sensitivity and specificity is the ELISA in which antibodies to *T. canis* larval excretory secretory antigens (8, 1) or to larval extracts are measured (9, 10).

In India reports of human toxocariasis have been presented (11, 3), but there are limited studies from Kashmir valley (12). Therefore the present study was conducted to determine the seroprevalence of toxocariasis in children of Kashmir valley.

Materials and Methods

Strategically located Jammu and Kashmir State constitutes the northern most extremity of India. It is situated between 32.17 degree and 36.58 degree north latitude and 37.26 degree and 80.30 degree east longitude. The projected population of the state is 76.77 laces. The state with its summer and winter capital at Srinagar and Jammu, respectively is divided into 14 districts.

For the present seroepidemiological study, samples were randomly selected from all the districts. A total of 286 children, out of which 162 were males and 124 were females in age group of 0-16 years were randomly selected from different districts of the Kashmir valley during year 2004-2006. A short questionnaire to obtain data concerning their age, sex, habits was filled for each child. Blood samples were collected using disposable syringes and sera were separated and stored in-20 °C until tested. Antibody (IgG) specific to *Toxocara* purified exceretory secretory (ES) antigen was detected by ELISA in all serum samples using kit obtained from IVD research Inc. Carlsbad, CA 92008. The test was performed as per manufacturer's instructions. Optical density (OD) value was recorded in an automatic ELISA reader (Anthos) at 450 nm. The samples were considered positive if absorbance reading was equal to or greater than 0.3 OD units and negative if absorbance reading was less than 0.3 OD units. Fisher's exact test was used for statistical analysis.

Results

In the present study out of 286 children, 94 (32.86%) were found *Toxocara* seropositive.

The risk factors that were found associated with the infection of toxocariasis in children population of Kashmir valley included family back ground, status of living conditions, and awareness about the disease. Gender was found a significant risk factor (P=0.00). Male children were found more infected (41.97%) as compared to females (20.94%). Paternal education remained an important risk factor for *Toxocara* infection (P<0.05). The percentage of infection in children whose fathers were not educated was 42.42% (56/132) compared to 24.67% (38/154) children whose fathers were educated. Maternal education had a great impact on the *Toxocara* infection in children and remained a significant risk factor for the *Toxocara* infection in the children (P=0.002). Children whose mothers were educated had significantly

lower prevalence (21. 50%) than those whose mother's were not educated (39.13%). The prevalence of *Toxocara* infection in families with fenced houses was less 28.31% compared to families with unfenced houses 39.16%. The prevalence of *Toxocara* infection was higher in those having contact with dogs 47.82% or with pets in their house 66.66% (Table).

A related factor for the prevalence of *Toxocara* infection in humans was the condition and status of vegetables taken by the subjects. The children who were in the habit of eating raw vegetables were more prone to infection (36.48%) than those who were not in the habit of eating raw vegetables (20.31%). Children who were in the habit of geophagia were also more prone to infection (36.48%). The majority of the study populations were using tap water, but some also used the well water, river water and other sources of water which included water from all these or some sources at a time. Children using the water from rivers and streams were more infected (43.75%) than those using well water (36.53%), followed by those using water from tap (public piped water supply) (25.97%). Water source was found significant risk factor for the prevalence of *Toxocara* infection ($P<0.05$). Majority of children were using unboiled water. Boiled water was also used by some children in the study population. Prevalence of infection was higher (40.14%) in the children drinking unboiled water than those drinking boiled water (26.38%). Water pretreatment was a significant risk factor for the prevalence of toxocariasis infection.

Discussion

Serological studies are of immense importance in the detection of infection by *T. canis*, as the clinical symptoms of toxocariasis are variable and non specific. The use of *Toxocara* ES antigen to detect antibodies against *T. canis* does not require the preabsorption of sera with embryonated *Ascaris* egg antigen (9, 1) and further no cross reaction between purified ES antigen and sera from individuals with *Ascaris lumbricoids*, Hook worms, *E. coli* or *Giardia lamblia* were observed (13).

The present study reports for the first time serological proven human toxocariasis in children of Kashmir valley. In different parts of the world, serological studies have demonstrated a variation in *Toxocara* seroprevalence ranging from 2.3% to 86% (11, 14). However the present study showed a higher rate of infection (32.86 %) than that of (6.4 %) subjects residing in a rural area near Chandigarh (11), Slovak Republic (15) which may be due to low standards of hygiene, frequent contact with the contaminated soil and less paternal education.

In our study, higher prevalence of infection was found among males than females. The difference among male and female was found significant; a similar result was reported earlier (15). In previous epidemiological studies association of several risk factors for toxocariasis has been reported such as exposure to dogs, socio economic status (1). In our study the children whose parents were illiterate were more positive indicating the effect of economic situation on seropositivity.

Table 1: Epidemiological analysis for *Toxocara* seroprevalence in the children of Kashmir Valley

Particulars / **Age**	**No. of samples analyzed**	**Positive (%)**	**Negative (%)**	***P-value***
Upto 16 yr	286	94 (32.9)	192 (67.1)	
Sex				
Male	162	68 (42.0)	94 (58.0)	0.000
Female	124	26 (21.0)	98 (79.0)	
Father's education				
Yes	154	38(24.7)	116(75.3)	0.001
No	132	56(42.4)	76(57.6)	
Mother's education				
Yes	102	22(21.6)	80(78.4)	0.002
No	184	72(39.1)	112(60.9)	
House fenced				
Yes	166	47(28.3)	119(71.7)	0.05
No	120	47(39.2)	73(60.8)	
Pet in house				
Yes	03	102(66.7)	101(33.3)	0.42
No	283	92(32.5)	191(67.5)	
Contact with dogs (neighbourhood/semi domesticated)				
Yes	46	22(47.8)	24(52.2)	0.01
No	240	72(30.0)	168(70.0)	
Eating raw vegetables/geophagia				
Yes	222	81(36.5)	141(63.5)	0.015
No	64	13(20.3)	51(79.7)	
Source of drinking water				
Stream/river/Ponds	80	35(43.8)	45(56.3)	0.01
Well	52	19(36.5)	33(63.5)	
Public piped water supply	154	40(25.0)	114(74.0)	
Condition of drinking water				
Boiled	144	38(26.4)	106(73.6)	0.01
Unboiled	142	57(40.1)	85(59.9)	

Contact with dogs or presence of pet in house was the high risk for *Toxocara* prevalence and was found significant factor for toxocariasis ($P<0.05$). Also significant association was found between presence of dogs in houses or in neighborhood and prevalence of toxocariasis in humans. A higher frequency of infection in individuals who maintained contact with dogs has been reported by many workers in different parts of the world (16-19).

During this study, the persons having the habit of eating raw vegetables or having a habit of geophagia were found having high seroprevalence of *Toxocara* infection. Holland *et al.* found a significant association between *Toxocara* seropositivity in children and a history of geophagia (20). In the current study the prevalence of *Toxocara* infection was more in people using water from streams, rivers, ponds and wells than those using water from public piped water supply and the difference was found statistically significant. Similar results were found by Hayashi *et al.* (21).

In our study it was observed that individuals whose houses were fenced were less likely to be infected with *Toxocara* relative to those whose houses were not fenced. Similar results were reported by Abe and Yasukawa (22). Thus reveals the high percentage of *T. canis* infection in toxocariasis in humans.

In conclusion, the high prevalence of *Toxocara* in Kashmir could be due to high prevalence of infection in large untreated and unconstrained dog population, low standards of hygiene and geophagic behavior among children. Health promotion by means of a school based programme of treatment improving standards of hygiene and control of infection in dogs are necessary for control and prevention of the disease.

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