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Serological evaluation of toxocarosis in Amedyia District, Duhok Governorate, Kurdistan Region Iraq

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Abstract

The ova of Toxocara canis is common environmental contaminants of human habitation, due to the fact that dogs serve as final hosts. The presence of Toxocara ova in the soil which considerable as a risky factor for human public health. Humans, particularly children, frequently ingest these ova accidently and infected with disease. Infection in humans, in contrast to their definitive hosts, remains unusual host, often resulting in disease caused by the migrating larval stages without development to adult stage. This study is the first study in Duhok Governorate and Kurdistan region to determine the seroprevalance of toxocarosis among human population and the relation of the associated factors. A total of 600 blood samples were collected from children and adults of different ages (5-70) years and both genders. Blood samples were collected in a gel tubes, then centrifuged for isolation of sera. The sera were kept at -20ºC until used for detection of anti Toxocara canis IgG antibodies using ELISA. Out of 600 serum samples 38 (6.3 %) were seropositive. The rate of infection was higher in females 22/285 (7.7%) than males 16/315 (5.1%). The individuals belong the age group less than 5 years were more prevalent (21.4%) than other groups followed by age group (5-14) year with infection rate (9.6%). Toxocarosis is prevalent in adults and children of Amedyia district. These results require periodical studies on the rate of infection and associated risk factors in other areas of Duhok Governorate and Kurdistan region.

Keywords: *Toxocara Canis, ELISA, Children, Larva Migrans, Duhok, Kurdistan*

1. Introduction

Toxocara species are roundworms from Ascaridae family, such as Toxocara canis, Toxocara cati, Toxocara malaysiensis, and Toxascaris leonina, are the most common zoonotic gastrointestinal helminths [1-4], that habit the intestine of dogs and cats throughout the world [5,6]. The ova of Toxocara species are common environmental contaminants of human habitation, due to the fact that the dogs and cats serve as final hosts and the presence of Toxocara ova in the soil which considerable as a risky factor for public health [7]. These ova may remain viable in the soil for months or even years [8]. Children's play habits and their outdoor activities put them at higher risk for infection [9,10]. Humans, particularly children, frequently ingest these ova accidently and become infected. Infection in humans, in contrast to their definitive hosts, often resulting in disease caused by the migrating larval stages. Visceral and ocular larva migrans are two clinical manifestations that result due to migration of larvae [11,12]. The enzyme-linked immunosorbent assay (ELISA), which employs antigens secreted by the second-stage larvae of T. canis, has sufficient specificity to be the reliable indirect test for diagnosing this infection [13,14]. Although comprehensive studies on Toxocara canis were conducted in the different regions of the world, little studies were conducted in Iraq. The aim of current study was to determine the seropositivity of Toxocara canis in children and adults and relation to the associated factors with infection in Amedyia District, Duhok Governorate, Kurdistan Region.

2. Material and Methods

A total of 600 blood samples were collected from children and adults of different ages (5- 70) years and both sexes. The present study started from May 2016 to April 2017 in different areas of Amedyia district in Duhok Governorate to determine the seropositivity rate of toxocarosis using ELISA as qualitative screening and determine the relation of the risk factors associated to the infection such as contact with dogs and soil, food habitation, residency, life style, and socioeconomic status. Blood samples were collected in gel tubes, then centrifuged for isolation of sera. The sera were kept at -20ºC until used for detection anti Toxocara canis IgG antibodies using a commercial ELISA Kit (DEMDITEC Diagnostics GmbH EN ISO 9001 certified company) according to instructions of the company. Analysis of data was carried out using the Chi Square test and Statistical Package for Social Science (SPSS). The protocol of the current study was approved by the researches Ethics Committee of the College of Medicine, Duhok University and Duhok Directorate of Health

3. Results and Discussion

A total of 600 subjects examined in the present study, 357 (59.5%) were children and 243 (40.5%) were adults. Regarding to gender, 285 (47.5%) were female and 315 (52.5 %) were male. A total of 336 (56.0 %) were lived in rural area, 182 (30.3 %) in urban area and 82 (13.7%) in suburban area. Overall, 536 (89.3) were contact with dogs, and 64 (12.5%) were not contact. The other socio-demographic characters and associated factors including age groups were listed in (Tab. 1-3). The result has been shown that the total rate of infection among examined population (38, 6.3%) were seropositive to anti-*Toxocara* antibodies using ELISA, while 562 (93.7) were seronegative (Fig. 1) It is obvious from (Tab. 2) that the individuals belong the age group less than 5 years were more prevalent 3/14 (21.4%) than other age groups followed by age group ranging from 5-14-year-old with infection rate 33/343 (9.6%). In addition to that there was no any case reported in age group ranging from 15-24-year-old. Statistical analysis revealed significant difference between the infection and different age groups.

The rate of infection was higher in females 22/285 (7.7%) than males 16/315 (5.1%) but the statistical analysis revealed no significant difference between the infection and gender. Regarding to the occupation of examined population, the result shows that the children were more prevalent 10/44 (22.7%) followed by students 26/342 (7.6 %). Statistical analysis revealed significant difference between occupation and infection (Tab. 3). It is obvious from the results that highest rate of infection 22/190 (11.6) was among subjects that their parent whom educational status was primary school, followed by 14/221 (6.3%) and 2/171 (1.2%) among parent whom educational status was secondary school and illiterate respectively, while there was no any case recorded among parent whom educational status was higher education. Statistical analysis of the results showed the presence of highly significant difference between all educational statuses.

The present study found that more prevalent rate among group with good socioeconomic status 9/86 (10.5%) when compared with moderate 25/362 (6.9%) and poor socioeconomic status 4/152 (2.6%). Statistical analysis revealed significant difference. All infected cases were recorded from rural areas 38/336 (11.3%) in relation to residency of examined individuals and statistical analysis revealed high significant difference. The present work reports for the first time serological proven human toxocarosis among population in Amedyia district, Duhok Governorate, Kurdistan region of Iraq. Toxocarosis is common in developing countries and some studies found that high frequency of human infection by *Toxocara* larvae [15-17]. Different prevalence rates of *Toxocara* infection were recorded in different countries ranging from 3-86% [18]. In the current study the results show agreement with this range of 10 infections when found that the total rate of toxocarosis among examined population was 6.3% using ELISA. The results of the present study were dissimilar to that have been observed by Al-Saeed et al. [17] in Mosul city (Iraq), when reported high seropositive rate 30.8% in examined children. Unexpected results were found in Fars Province (Iran) related to toxocarosis [18], they recorded high rate of infection (30.1%) of urban children in comparison to rural children (20.2%).

A study conducted by Roldán et al. [19] revealed that low seropositive rate 1.39% in examined children of the Amazonian city (Brazil), this result was in contrast with the result of the present study when reported that the seropositivity in children aged <5 years was 21.9%. In western Iran, they found that high rate 25% of school children between 7-14 year ages were seropositive [20]. A study conducted by Jalali et al. [21] in Shiraz, southern Iran, reported (6.4%) seropositive rate in rural area among individuals with no clinical signs and (23.3%) in individuals with clinical signs but there was no significant correlation was reported between contact with dogs and *Toxocara* infection. On the other hand, high prevalence rate 76.6% of toxocarosis among 7-12-year-old children in Taiwan, the reason was a significant correlation between histories of raising dogs and seropositivity [22]. While in

Nigeria reported 30% seropositivity among individuals aged 2-21 year but showed that contact with dogs was not an important factor for *Toxocara* infection [23]. A study conducted by [24] reported that 4.8% of healthy blood donors and 1.2% of children were infected with toxocarosis in Argentina. Researchers showed that low rate of infection 2% in Indian children by serological examination [25]. The rate of seropositivity found among children in the present study 38 /600 (6.3%) is consistent with reports conducted in children groups (26.6%) from Egypt [26], Spain 27.2% [27], Nigeria 29.8% [28], Turkey 25.9% [29], Bolivia 24.8% [30]. The differences in seropositive rates may be due to variation in the climatic conditions such as temperature and humidity which effect on the survival and viability of *Toxocara* ova in the environment, life and eating habits (eating unwashed raw vegetables), occupation and personal hygiene. The higher seroprevalence of anti *Toxocara* IgG antibodies in older age groups was due to their longer exposure to risk factors associated to the infection, while unexpected results in the current study were found in old age group that lowest infection rate with toxocarosis, the reasons might be due to the life style, social behaviour, socioeconomic status number, spreading and contact with dogs. The present study reported that infection rates in females were slightly higher than males. Dissimilar results were found in other studies that males with highest infection rate compared with females [20,31]. The authors suggested that difference might be due to the fact that outdoor activities were restricted in girls and most societies due to some social and religious restrictions, females are relatively stay indoors while males have to work in outdoor. In conclusion, toxocarosis is endemic in Amedyia district of Duhok Governorate, Kurdistan region of Iraq. These results require periodical studies on the rate of infection and associated risk factors in other areas of Duhok Governorate and Kurdistan Region

Table 1: Frequency distribution of sociodemographic characteristics and associated factors of study participants (no. 600)

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Variable		Frequency	Percent
Gender	Male	315	52.5
	Female	285	47.5
Age Group (Year)	< 5	14	2.3
	5 – 14	343	57.2
	15 -24	46	7.7
	25 – 44	154	25.7
	45 and above	43	7.2
Residency	Rural	336	56.0
	Suburban	82	13.7
	Urban	182	30.3
Contact with dogs	No	64	12.5
	Yes	536	89.3
Socio-economic Status	Poor	152	25.3
	Moderate	86	14.3
	Good	362	60.3
Total		600	100.0

Table 2: Seroprevalence of toxocarosis among population according to age and sex in Amedyia District, Duhok Governorate

Variables		No. of Examined	No. (%) +ve	No. (%) - ve	df	P-value
Age group (Year)						
	< 5	14	3 (21.4)	11 (78.6)		
	5 – 14	343	33(9.6)	310 (90.4)		
15 -24		46	0	46 (100)	4	0.000
	25 – 44	154	1 (0.6)	153 (99.4)		
	45 and above	43	1 (2.3)	42 (94.7)		
Sex						
Gender	Male		16(5.1)	299 (94.9)		
					1	0.185
	Female		22 (7.7)	263 (92.3)		

Table 3: Seroprevalence of toxocarosis associated factors in Amedyia District

Variables		No. of Examined	No. (%) +ve	No. (%) - ve	df	P-value
Occupation						
	House wife	80	1 (1.3)	79 (98.7)		
	Student	342	26 (7.6)	316 (82.4)		
Child		44	10 (22.7)	34 (77.3)	3	0.000
	Unemployed	134	1 (0.7)	153 (99.4)		
Education						
	Illiterate	171	2 (1.2)	79 (98.7)		
	Primary school	190	22 (11.6)	316 (82.4)		
Secondary school		221	14 (6.3)	34 (77.3)	3	0.001
	High education	18	0 (0)	153 (99.4)		
Socioeconomic						
	Poor	152	4 (2.6)	148 (97.4)		
	Moderate	362	25 (6.9)	337 (93.1)		
Good		86	9 (10.5)	34 (89.5)	2	0.045
Residency						
	Rural	336	38 (11.3)	298 (88.7)		
	Suburban	82	0 (0)	82 (100)		
Urban		182	0 (0)	182 (100)	2	0.000

		Contact with dogs			
No	63	0 (0)	63 (100)		
				1	0.029
Yes	536	38 (7.1)	498 (92.9)		

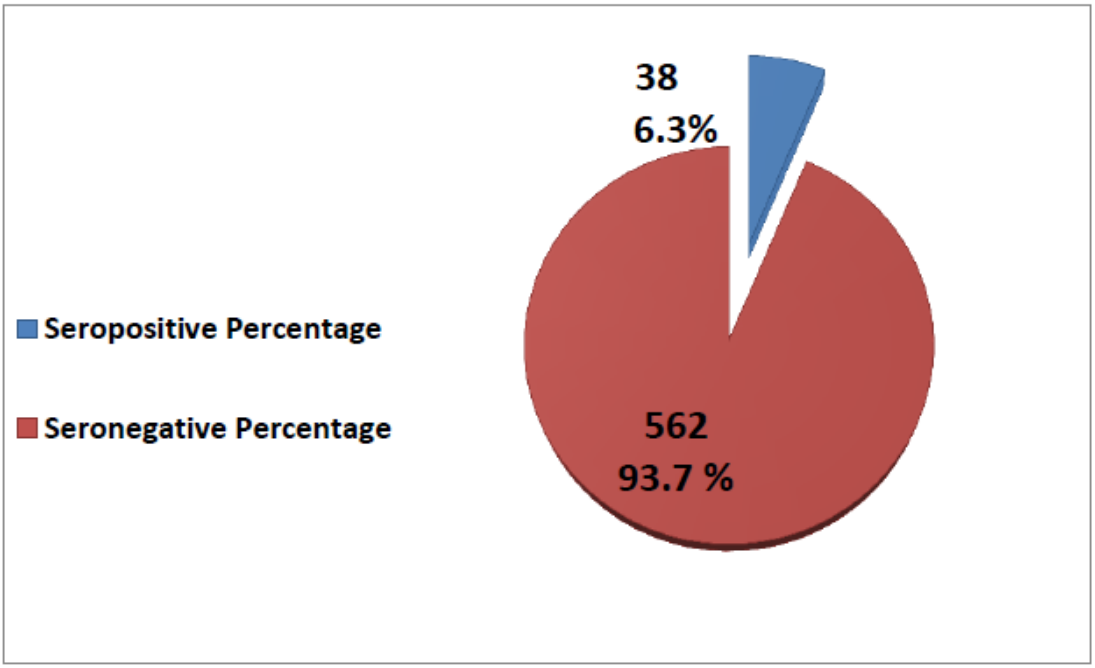

Figure 1: The seropositivity with *Toxocara canis* among examined population (n=600).

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