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Toxoplasmosis in hemodialysis and healthy individuals in Shush county, Southwest of Iran

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ABSTRACT

Introduction: Toxoplasmosis is caused by *Toxoplasma gondii*. Hemodialysis patients are at higher risk for the toxoplasmosis than healthy people and a rapid and definitive diagnosis is important in these individuals. Thus, the aim of the research was to investigate the toxoplasmosis in hemodialysis and healthy individuals in Shush County, southwest of Iran in 2016.

Methods: In the research of cross-sectional, 82 hemodialysis patients (the test group) and 82 healthy individuals (the control group) were randomly selected. IgG and IgM of *T. gondii* were measured by the ELISA method.

Results: Of 82 control group, 46 (56.1%) and 36 (43.9%) were males and females, respectively that of 82, 25 (30.48%) were positive for IgG (15 (60%) and 10 (40%) for males and females, respectively). In the test group, 46 (56.1%) and 36 (43.9%) were males and females, respectively. Of 82, 42 (51.21%) was positive for IgG (21 (50%) for both males and females). IgM of *T. gondii* was negative in both test and control groups. A significant difference was found between the test and control groups for IgG (P =0.007) but, no significant differences were between the gender and/or the age with IgG in both test and control groups (P >.05).

Conclusion: The results indicated that the prevalence of *T. gondii* was higher in hemodialysis patients than healthy persons. Since, hemodialysis patients have immunodeficiency; so, the health authorities of the city must pay more attention to control of the infection, especially in hemodialysis patients.

Introduction

Non- pathogenic and pathogenic parasitic infections in many parts of the globe, especially among children in developing countries, have high prevalence (1). *Toxoplasma gondii* (*T. gondii*) is an obligate intracellular parasite belonging to phylum Apicomplexa (2). Toxoplasmosis is caused by the protozoa that has a global outbreak The parasite infect most of the warm-blooded vertebrates, such as humans, other mammals, livestock and birds (3). The protozoan parasite needs 2 hosts to complete its life cycle that includes the warm-blooded vertebrates as an intermediate host and the Felidae family as the definitive (2). The parasite sexual cycle takes placed in the intestinal epithelium of the hosts (4). The protozoan antibodies are in one-third of all humanity, particularly in low-income and developing countries (5). The infection prevalence depends on food habits, eographicalsituation, age, and many epidemiological

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agents (6). The infection occurs mostly in tropical and subtropical regions. The consumption of water contaminated with oocytes, raw or undercooked meat containing tissue cysts, and congenital transmission is the main routes of transmission. Prevalence of the infection differ between 30% and 60% in developed and developing countries, respectively (2). The prevalence rate of *T. gondii* was reported in South Korea (from 0.27 to 12.9%), in USA (22.5%), in Izmir Turkey (23.1%) and in Iran (51.8%) (7). Pregnant women and immunocompromised individuals are at high risk for the infection (5). The protozoan is one of the main opportunistic infections in immunocompromised people such as hemodialysis patients (8). Symptoms in persons with healthy immune system are transient and mild such as swelling of lymph glands and slight fever, while in immunocompromised individuals such as hemodialysis patiens, latent form of the protozoan can activated and cause swelling of lymph glands, damage to the central nervous system, cerebral calcifications, epilepsy, myocarditis, pneumonia and even death (6, 8). Since, hemodialysis patients have immunodeficiency; these individuals are at higher risk for reactivation of the infection latent form. So that, a rapid and definitive diagnosis is important in these individuals (9). Thus, the aim of the research was to investigate the toxoplasmosis in hemodialysis and healthy individuals in Shush County, southwest of Iran in 2016. The study was conducted for the fist time in the County.

Methods

Study area

Shush county is in Khuzestan province, southwest of Iran. Shush population was reported 53.897 until 2006 and the county has an area of 3.577 square kilometers. In summer season, the county has a temperature of about 50° C. Thus, Shush has tropical and subtropical climates.

Study population

The research is a cross-sectional study. In the study, 82 healthy subjects (the control group) and 82 hemodialysis patients (the test group) were randomly selected that referred to Hemodialysis Department of Nezam Mafi Hospital of Shush County, southwest of Iran, in 2016. To participate in the study, the individuals were informed about the nature and purpose of the research and an informed consent was taken from all individuals.

Sampling and experiments

For sampling, 4 ml blood samples taken from hemodialysis and healthy individuals. After centrifuging, 2 ml of serum was placed in micro-tube and kept at - 20 ° C until the time of experiment. In final, IgG and IgM antibodies of *T. gondii* were measured by ELISA (abcam, USA) method (10).

Statistical analysis

Chi-square test was used for significance differences and SPSS statistical software of version 20 was used for data analysis. The P-value less than 0.05 were considered as significant.

Results

Table 1 shows the evaluation of IgG antibody of *T. gondii* by the ELISA method in healthy subjects (the control group) according to the gender. Bases on the results, of 82 samples, 46 (56.1%) and 36 (43.9%) were males and females, respectively. In total, of 82, 25 (30.48%) were positive for IgG antibody that 15 (60%) and 10 (40%) were males and females, respectively. Also, table 2 shows the evaluation of IgG antibody of *T. gondii* by the ELISA in hemodialysis patients (the test group) according to the gender. Here, too, of 82 samples, 46 (56.1%) and 36 (43.9%) were males and females, respectively. Generally, of 82, 42 (51.21%) were positive for IgG that 21 (50%) were found in both males and females.

Table 1. Evaluation of IgG antibody of *T. gondii* by the ELISA in healthy subjects (the control group) according to the gender

Control group					
			IgG		Total
			Positive	Negative	
Gender	Male	Count	15	31	46
		%	60.0%	54.4%	56.1%
	Female	Count	10	26	36
		%	40.0%	45.6%	43.9%
	Total	Count	25	57	82
		%	100.0%	100.0%	100.0%

Table 2. Evaluation of IgG antibody of *T. gondii* by the ELISA in hemodialysis patients (the test group) according to the gender

Hemodialysis patients					
			IgG		Total
			Positive	Negative	
Gender	Male	Count	21	25	46
		%	50.0%	62.5%	56.1%
	Female	Count	21	15	36
		%	50.0%	37.5%	43.9%
	Total	Count	42	40	82
		%	100.0%	100.0%	100.0%

Table 3. evaluation of IgG antibody of *T. gondii* by the ELISA in healthy subjects (the control group) according to the age groups

Control group					
			IgG		Total
			Positive	Negative	
Age groups	Under 30 years	Count	6	17	23
		%	24.0%	29.8%	28.0%
	Between 30-60	Count	12	26	38
		%	48.0%	45.6%	46.3%
	Above 60 years	Count	7	14	21
		%	28.0%	24.6%	25.6%
	Total	Count	25	57	82
		%	100.0%	100.0%	100.0 %

A significant difference was found between the test and control groups for IgG antibody (P =0.007) but statistically, no significant difference was between the gender and IgG antibody in both the test and control groups (P >0.05). Also, the IgM antibody was negative in both the test and control groups. Table 3 shows the evaluation of IgG antibody of *T. gondii* by the ELISA in healthy subjects (the control group) according to the age groups. Of 82 healthy subjects, 23 cases were under 30 years (6 (24%) positive cases for IgG), 38 cases between 30-60 years, and 21 individuals were above 60 years that 12 (48%) and 7 (28%) were positive for IgG, respectively. Table 4 shows the evaluation of IgG antibody of *T. gondii* by the ELISA in hemodialysis patients (the test group) according to the age groups. From 82 hemodialysis patients, 10 cases were under 30 years (4 (9.5%) positive cases for IgG), 50 cases were between 30-60 years, and 22 cases were above 60 years that 24 (57.1%) and 14 (33.3%) were positive for IgG, respectively. No significant difference was between the age and IgG in both the test and control groups (P >0.05).

Table 4. Evaluation of IgG antibody of *T. gondii* by the ELISA in hemodialysis patients (the test group) according to the age groups

Hemodialysis patients					
			IgG		Total
			Positive	Negative	
Age groups	Under 30 years	Count	4	6	10
		%	9.5%	15.0%	12.2%
	Between 30-60	Count	24	26	50
		%	57.1%	65.0%	61.0%
	Above 60 years	Count	14	8	22
		%	33.3%	22.0%	26.8%
	Total	Count	42	40	82
		%	100.0%	100.0%	100.0 %

Discussion

Hemodialysis is used as a therapy for patients who have end-stage renal disease. The number of hemodialysis patients has increased worldwide annually (9). Hemodialysis patients encounter intense complications such as psychotic disorders (11), various cutaneous abnormalities (12), congestive heart failure (13), and weakness of the immune system (14). *T. Gondii* is the most common parasite that causes opportunistic infections in immunocompromised persons (15). Because of the immunodeficiency, hemodialysis patients are at higher risk for the reactivation of toxoplasmosis than healthy people that a rapid and definitive diagnosis is important in these individuals (9); thus, the aim of the research was to investigate the toxoplasmosis in hemodialysis and healthy individuals in Shush County, southwest of Iran in 2016. The study was conducted for the first time in the County. Our findings showed that of 82 control group, 46 (56.1%) and 36 (43.9%) were males and females, respectively. Of 82, 25 (30.48%) were positive for IgG that 15 (60%) and 10 (40%) were males and females, respectively. In the test group, 46 (56.1%) and 36 (43.9%) were males and females, respectively. Of 82, 42 (51.21%) were positive for IgG that 21 (50%) were in both males and females. These results showed that the prevalence rate of *T. gondii* was higher in hemodialysis patients than healthy persons; the results are consistent with previous researches. In 2014, Rasti et al. studied the prevalence of IgG and IgM antibodies of *T. gondii* in Kashan and Qom (two cities in center of Iran) and showed that of 135, 63% were positive for hemodialysis patients and of 120, 33.3% were for healthy subjects (16). Similarly, in other study, of 90 hemodialysis patients, 54 (60.0%) were positive for IgG and 3 (3.3%) were positive for IgM. Also, of 90 of healthy subjects, 34 (37.8%) were positive for IgG and all healthy individuals were negative for IgM (17). On the other hand, the infection occurs mostly in tropical and subtropical areas and due to high temperature in Shush county, this prevalence is reasonable. Similarly, in Ahvaz (a city in southwest of Iran) in 2013, Saki et al. showed that the prevalence of this protozoan was 26% in healthy persons, but in hemodialysis patients, it was found to be 29.3%. (9). Also, in 2011 Maraghi et al. in Abadan and Khoramshahr (two cities in southwest of Iran) showed that 61 of 150 hemodialysis patient

samples were positive but only 39 of 150 healthy individual samples were positive. (7). The results of two studies indicated that the prevalence of this protozoan was more in hemodialysis patients than healthy individuals, significantly. The results have also been obtained in other countries with same climatic conditions. For example, in 2014, Ayser et al. in Baghdad, Iraq, showed that 129 (32.25%) of 400 hemodialysis samples were seropositive for IgG of *T. gondii* (18).The risk factors of toxoplasmosis are "place of residence", "contact with cat" and "age". The Felidae family shed oocytes by their feces. The oocytes can survive in environment such as warm and humid weather as well as moist soil, for months and even years (19). In the research, no significant difference was between the age and IgG in both the test and control groups (P >0.05) that can be explained due to of low sample size. Overall, the study indicated that seroprevalence of *T. gondii* was higher in hemodialysis patients than healthy persons. The results can be a help in planning to prevent and control the infection in hemodialysis patients. The limitations of the study including: a standard questionnaire was not used for collecting data as well as the risk factors of toxoplasmosis were not thoroughly examined in hemodialysis patients and also, low sample size.

Conclusion

The results indicated that the prevalence of *T. gondii* was higher in hemodialysis patients than healthy persons. Since, hemodialysis patients have immunodeficiency; so, the health authorities of the city must pay more attention to control of the infection, especially in hemodialysis patients and the evaluation of *T. gondii* is important in the patients.

Ethical disclosure

Informed consent was obtained from all participants included in the study.

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Authors' contribution

All the authors have accepted responsibility for the entire content of this manuscript.

Conflict of interest

There is no conflict of interest.

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