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ORIGINAL STUDY

Epidemiological and Frequency Rate of *Toxoplasma gondii* in Arthritis Patient's

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Abstract

The present study has been designed to Determining the prevalence and risk factors of *Toxoplasma gondii* in patients with rheumatoid arthritis. All samples of the experiment were taken from cephalic vein in non-heparinized tubes, at the conclusion of each treated and control period, all samples collection from Al-Dewaniyah Hospital, and from clinical private from July-2022 to Feb. 2023. The experiment was designed and divided into two groups, a group of healthy people and a group of people infected with rheumatoid arthritis with infection with *Toxoplasma gondii*. 1. Healthy group: 100 samples from peoples without any disease or treatment. 2. Patients group: 100 samples from peoples' patients treated and untreated with rheumatoid arthritis with infection of *Toxoplasma gondii*. The current study showed that 33 (33%) of patients were seropositive for *Toxoplasma* IgG, while all controls with seronegative for *Toxoplasma* IgG. Seropositivity of *Toxoplasma* Abs IgG showed significant differences between patients and control groups p value (0.0254). The current study showed that 33 (33%) of patients were seropositive for *Toxoplasma* IgG, while all controls with seronegative for *Toxoplasma* IgG. Seropositivity of *Toxoplasma* Abs IgG showed significant differences between patients and control groups p value (0.0254). Distribution of *Toxoplasma* IgG antibodies according to age groups showed that the higher ratio of *Toxoplasma* antibodies was found in age group >51 years. In addition, there was no significant between the *Toxoplasma* IgG seropositive and age groups of patient's arthritis. The present results showed no significant association between seropositivity of *Toxoplasma* antibodies and area of residence, in urban areas, there were 48 patients with arthritis and 12 with toxoplasmosis, while in rural areas, 52 patients with arthritis and 21 had toxoplasmosis.

Keywords: IgG, Rheumatoid factor, Anti-CCP, ESR, *T. gondii*

1. Introduction

Toxoplasmosis is a parasitic disease with worldwide distribution caused by obligate intracellular coccidian protozoan *Toxoplasma gondii* (*T. gondii*) [1]. It is estimated that one-third of the world's population are infected with this parasite in both developed and developing countries [2]. Humans can be infected with the parasite through different routes, including consumption of raw or undercooked meat containing tissue cysts of the parasite, ingestion of sporulated oocysts from contaminated water and food, and vertical transmission during pregnancy through the placenta to the fetus [3]. Rheumatoid arthritis (RA) is a common autoimmune disease, which is a major cause of

inflammation of the joints and the principal cause of disability that affects 0.5–1% of the population [4,5]. The disease presents with swollen joints, production of autoantibodies (rheumatoid factor), and systemic effects [6]. In recent years, the role of infectious agents, especially bacteria and viruses, has been identified in the pathogenesis of autoimmune diseases, while the role of parasitic infections due to their vague effects on host immunity has not been well-investigated. Some geoepidemiological studies showed that host genetic susceptibility interacts with lifestyle and environmental factors, such as socioeconomic status, dietary habits, environmental pollutants, and ultraviolet radiation exposure; further, infections increase the risk of developing autoimmunity [7].

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2. Materials and methods

2.1. Collection samples

All samples of the experiment were taken from cephalic vein in non-heparinized tubes, at the conclusion of each treated and control period, all samples collection from Al-Dewaniyah Hospital, and from clinical private from July-2022 to Feb. 2023.

2.2. Experimental design

The experiment was designed and divided into two groups, a group of healthy people and a group of people infected with rheumatoid arthritis with infection with *Toxoplasma gondii*.

1. Healthy group: 100 samples from peoples without any disease or treatment.
2. Patients group: 100 samples from peoples' patients treated and untreated with rheumatoid arthritis with infection of *Toxoplasma gondii*.

All samples of the experiment were taken from cephalic vein in non-heparinized tubes, at the conclusion of each treated and control period. After being separated (by centrifugation at 3000 rpm for 5 min), blood serum samples were stored at -20°C pending evaluation of the Serological diagnosis of rheumatoid arthritis, Serological screening for specific antibodies to toxoplasmosis in treated and untreated patients.

2.3. Statistical analysis

Results were expressed as mean \pm standard error of the mean (SEM). Comparisons were performed using one way analysis of variance (ANOVA1) and newman-keuls to test all groups unpaired values. Differences were considered to be significant at the level of $P < 0.05$.

3. Results

3.1. Epidemiology of *Toxoplasma* in arthritic patients

The current study showed that 33 (33%) of patients were seropositive for *Toxoplasma* IgG, while all controls with seronegative for *Toxoplasma* IgG. Seropositivity of *Toxoplasma* Abs IgG showed significant differences between patients and control groups p value (0.0254) (Table 1).

Distribution of *Toxoplasma* IgG antibodies according to age groups showed that the higher ratio of *Toxoplasma* antibodies was found in age group

Table 1. *Toxoplasma* antibodies in arthritis patients and controls.

Study groups	Toxoplasma IgG			P value
	Negative	Positive	prevalence	
Arthritis	67	33	33	0.0254
Controls	96	4	4	

>51 years. In addition, there was no significant between the *Toxoplasma* IgG seropositive and age groups of patient's arthritis (Table 2).

The present results showed no significant association between seropositivity of *Toxoplasma* antibodies and area of residence, in urban areas, there were 48 patients with arthritis and 12 with toxoplasmosis, while in rural areas, 52 patients with arthritis and 21 had toxoplasmosis (Table 3).

4. Discussion

Salman & Mohammed [8] reported that the toxoplasmosis prevalence increased with age, but this trend was not statistically significant. However, Saheb *et al.* [9] discovered a non-statistically significant negative correlation between age and seropositivity. Consistent with a previous study by Siyadatpanah *et al.* [10] found that the prevalence of toxoplasmosis in rural areas was substantially higher than in urban areas. Those employed in landrelated occupations and those residing in overcrowded conditions are responsible for these results. Agricultural endeavors, specifically farm buildings and their surroundings, which contain cats and intermediate hosts, are significant sources of infection in rural areas, not just locally. Due to

Table 2. Anti-*Toxoplasma* IgG in arthritis according to the age.

Age patients	Anti- <i>Toxoplasma</i> IgG		p-value
	Positive	Prevalence	
18–29	6	18.18	0.96095 ^a
30–40	7	21.21	
41–50	9	27.27	
>51	11	33.33	
Total	33	33	

Significant difference at ($P \leq 0.05$).

^a Non-Significant.

Table 3. Anti-*Toxoplasma* IgG in arthritis patients with Residency.

Residency	No. Arthritis	Anti- <i>Toxoplasma</i> IgG+		P value
		Positive	Prevalence	
Urban	48	12	36.36	0.0152 ^a
Rural	52	21	63.63	
Total	100	33	33	

Significant difference at ($P \leq 0.05$).

^a Significant.

the simplicity with which *T. gondii* can migrate between its natural habitat and human settlements, *T. gondii* spread is a threat to human communities to conflate domestic and sylvatic cycles in terms of where they appear, who governs them, and how biologically secure they are Sarfraz-ur-Rahman *et al.* [11]. Inal & Taş [12] stated that consuming raw or undercooked meat was not identified as an independent risk factor for toxoplasmosis-positive individuals. Particularly, urban pavement is believed to contribute to the shortened oocyst removal period of cats, indicating that differences in hygiene and socioeconomic status may account for the seropositivity disparity between rural and urban areas. The lack of knowledge and access to soil among farmers is to blame for these results. People, who work with cattle or in slaughterhouses, consume raw or undercooked meat or have cats as pets are more likely to test positive for *Toxoplasma* antibodies than those in other occupations, as they are more likely to come into contact with the parasite through these activities contaminated with *T. gondii* [13]. According to Salman & Mohammed [8], a person infected with toxoplasmosis after imbibing or ingesting dust particles containing infectious oocysts. A high seroprevalence for sporulation and oocyst survival may have also resulted from insufficient hygiene, nutrition, and favourable weather conditions. Due to cultural differences and climatic factors that influence oocysts, the primary objective of hazards varies considerably between nations. Location, sample age, the sensitivity of the serological technique used, the availability of oocyst-contaminated food and water, and other variables can influence the reported seroprevalence [10]. All patients were required to complete a questionnaire to confirm potential risk factors for *Toxoplasma* infection and investigate environmental and socioeconomic patterns in both cases and healthys. Although it has been shown that rural residents have a higher risk of toxoplasmosis than urban residents, we found a statistically significant difference in seroprevalence between rural and urban areas (p -value = 0.0251*), which is consistent with Khattab *et al.* [14]. Another study indicated a statistically significant difference between those who consumed raw meat, interacted with cats and had *Toxoplasma*-positive soil [15]. The infection rate was significantly higher among gardeners than those who did not engage with soil regularly. Soil and sediment may have been contaminated by oocysts from cats that have been buried and sporulated, as they can remain infectious for several months and up to a year [16].

5. Conclusions

Seropositivity for *Toxoplasma* IgG was significantly different in the arthritic group compared to the control group, according to the present investigation. People older than 51 years old had the greatest ratio of *Toxoplasma* antibodies, according to the study. Seropositivity was not significantly associated with age groups of arthritis patients, though. In addition, there was no discernible disparity in seropositivity between rural and urban regions. Although further study is need to validate this, this indicates that *Toxoplasma* infection might not be directly associated with the onset of arthritis.

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