

Original Research Article

Assessment Levels of IL-17, Chemerin, and Biochemical Variables in Women Pregnant Infected with *Toxoplasma gondii*

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Abstract: *Objective:* The current research study was completed in some areas of Kirkuk Governorate, where samples were collected randomly from pregnant women who had miscarriages arriving at government hospitals and some private medical clinics, whose ages ranged between 18-35 years for a period from 25/3/2024 to 1/10/2024. *Method:* 150 samples were collected from pregnant women who had miscarriages (first miscarriage). It was suspected that they were infected with *Toxoplasma*, and a rapid test was performed to detect IgM and IgG, as 60 samples were confirmed to be infected with the *Toxoplasma* parasite through the appearance of a positive IgG result, and 30 uninfected samples were IgM negative. After that, blood was taken from patients and healthy and separated using a centrifuge. Then the interleukin-17-IL-17, Chemerin, and some biochemical variables such as thyroid hormones (T3, T4, TSH), and antioxidants including glutathione peroxidase -GPX, Superoxide dismutase -SOD and Copper-Cu were measuring. *Result:* The results of this study showed a significant rise in each parameter (IL-17, chemerin, T3, T4, TSH, and Cu) and a significant low in concentration of (GPX, SOD) in the sera of women infected with *T.gondii* compared to healthy women, with a probability of $P \leq 0.05$.

Keywords: *Toxoplasma gondii*, IL-17, Chemerin, Thyroid hormone, Antioxidant.

INTRODUCTION

Toxoplasmosis is an infection caused by the parasite *T. gondii* from new animals Mandatory indoor mobiles where people differ due to the mass destruction as hosts in the city center, while many people Members of the cat family act as intermediate hosts for the parasite [1, 2]. *T.gondii* is an intracellular parasite of many types of tissues, including muscles [3].

The parasite infects Humans through eating food or water contaminated with Oocyst egg sacs excreted in the feces of infected cats or by consuming raw or undercooked meat containing tissue cysts It can be congenitally transmitted from an infected mother to the fetus [4].

Toxoplasmosis infection is globally widespread among humans, as it varies from one region to another. Approximately one-third of the world's population is susceptible to infection with the parasite. Infection is usually asymptomatic in people with complete immunity and immunocompetent individuals. In contrast, the infection is severe and dangerous in people with incomplete immunity immunocompromised, for example, pregnant women and people infected with AIDS [5].

The parasite is transmitted from the infected mother to the fetus via the placenta, and therefore the infection does not cause clinical signs in children in the early stages, except when they grow older, other signs appear, including placentitis and toxoplasmosis. Therefore, the severity of the disease depends on factors including immunity, the parasite's strain, the dose's size, and the type of virus [1].

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Interleukin 7 is one of the pro-inflammatory cytokines produced by Th17 cells. Other cells, including natural killer cells and CD4+ T cells, contribute to inflammatory responses. Interleukin 7 plays multiple functions in the development of autoimmune, allergic, and neoplastic diseases through the stimulation of proinflammatory and neutrophil-promoting chemicals. It participates in host defense against many pathogens, including bacteria, fungi, and parasites [6].

Chemerin is one of adipokines consisting of 163 amino acids and is activated by the serine protease enzyme to form the active chemerin [7]. The chemerin hormone plays a prominent role in many diseases and its association with cardiovascular diseases [8].

The thyroid gland secretes two types of hormones, which are iodine-containing and non-iodine-containing hormones. The iodine-containing hormones are triiodothyronine and tetraiodothyronine, or what is called thyroxine. As for the non-iodine-containing hormones, they are calcitonin [9].

Antioxidants are defined as a molecule or compound that hinders or delays the oxidation of molecules. It works at low concentrations compared to the concentrations of protected molecules [10].

The current research aimed to evaluate the level of interleukin IL-17, the chemerin hormone, the relationship of thyroid hormones and some levels of antioxidants with infection with the *T. gondii* parasite.

Collection of Sample Blood

Samples were collected randomly from pregnant women who had miscarried arriving at Kirkuk General Hospital for a period from 25/3/2024 - 1/10/2024, 90 blood samples were collected from pregnant women after performing a rapid test to detect antibodies (IgG, IgM) to confirm infection with the *T. gondii* parasite. 60 samples were collected. Blood from women who had positive IgG levels, and 30 blood samples from pregnant women who had negative IgM. After that, blood was taken from both groups and separated using a centrifuge, then the concentration of their physiological parameter was estimated and at their level Probability $P \leq 0.05$.

Rapid test for IgG/IgM antibodies specific for *Toxoplasma gondii*

The ready-made kit was used for this test to detect the presence of specific antibodies to the parasite. The working principle of this test depends on the capillary property. Two types of antibodies, Ab, are used against the antigen Ag. One of the antibodies is fixed on the chromatographic paper, while the other is attached to colloidal gold. When the sample is added to the hole of the slide, the antigen in the sample forms an immune complex with the antibody called colloidal gold. The formed immune complex moves with the sample and adheres to the antibody that is fixed on the membrane. After that, the immune complex is formed with the fixed antibody, which leads to the formation of a red line. When the red line appears at the letter C, it indicates a negative result. When two lines appear, the first at the letter C and the second at the letter T, this indicates to the positive result.

Estimation of the concentration of IL-17, chemerin, thyroid hormones and antioxidants in blood serum

The concentration of (IL-17, chemerin, and thyroid hormones, GPX, SOD) in sera was determined according to several kits prepared by Elabscience an American company.

Estimation of the concentration of copper in blood serum:

The concentration of copper in blood serum was estimated using a ready-made assay kit from M Spectrum Company -Rome-Italy.

Statistical Analysis

SPSS was used to analyze the study results by calculating the mean and standard deviation between the study groups at the probability level of $P \geq 0.05$.

RESULTS

Determination of IL-17, chemerin, thyroid hormones, and antioxidants in all groups:

Table (1) shows the $M \pm S.D$ parameters in the patients and Control.

Table 1

Groups Parameters	Mean \pm SD	
	Control	Patients
IL-17 (pg/ml)	223.45 \pm 65.76	320.76 \pm 70.84
Chemerin (ng/ml)	1.89 \pm 0.22	5.34 \pm 1.44
T3(pg/ml)	2.33 \pm 0.86	7.25 \pm 1.66

Groups Parameters	Mean ± SD	
	Control	Patients
T4 (pg/ml)	5.44±1.98	8.45±1.43
TSH (pg/ml)	2.65±0.95	10.54±1.32
GPX (pg/ml)	456.87±80.431	125.654±33.65
SOD (pg/ml)	55.76±15.09	20.54±7.65
Cu (ng/ml)	22.76±5.98	33.54±10.23

P ≤ 0.0

The results of this current showed a significant elevated in the (IL-17, chemerin, T3, T4, TSH and Cu) and decrease in (GPX, SOD) in the sera of pregnant with *T.gondii* compared women uninfected). at P ≤ 0.05. as in the following fig (1).

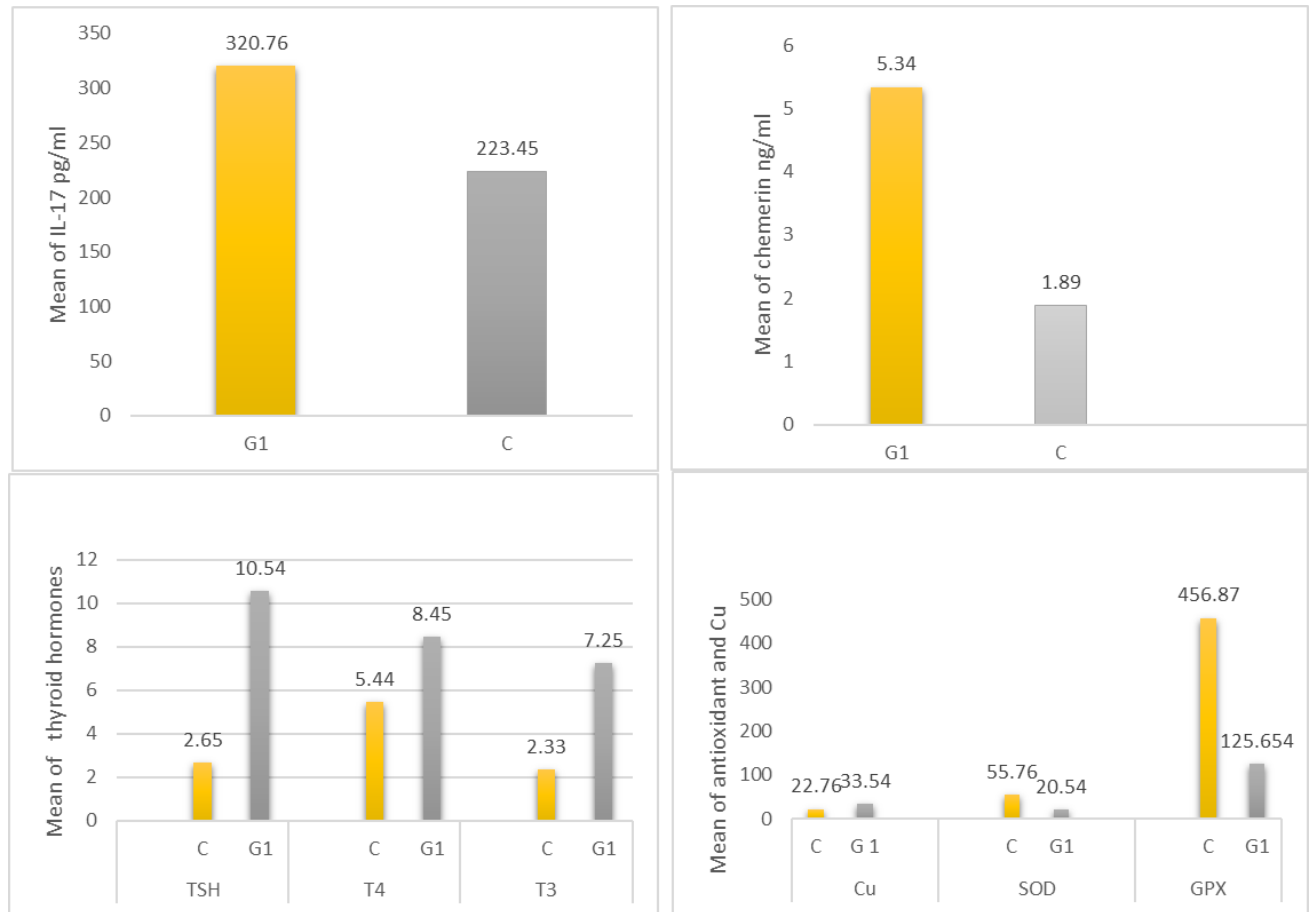


Fig. 1: An average of the parameter of all parameters in all groups

DISCUSSION

Diagnosing infection with the *Toxoplasma gondii* parasite using the *Toxoplasma* Rapid test kit (IgM/IgG)

The current study was recorded by examining 150 blood serum samples using Rapid test, 60 samples were positive (40%) for the IgG antibody, 40 samples were negative (26%) for the IgG antibody (30) and 30 samples were negative (20%) for the IgM antibody and 20 Positive sample (13.3%) for IgM antibody.

The results of the current research agreed with both [11] in Tikrit, where the percentage of IgG reached 66% and 0% for IgM, and the results of [12] in Salah al-Din, where the percentage of IgG reached 78.33% and 21.67% for IgM, while the results of the research did not agree with the results of [13] in Al-Tarmiya area, north of Baghdad, 21.4% IgG, 63.2% IgM, as the percentage of IgG antibodies was lower than the percentage of IgM in pregnant women infected with the parasite.

The antibody plays a role in the immune response in controlling the spread of the parasite. It begins to appear one to two weeks after infection, and reaches its peak after 6-8 weeks. It starts to decrease gradually, so It gives the body the ability to control parasitic infections and prevent their spread [14].

The reason behind this difference in the proportions of antibodies is due to the parasite's ability to stimulate immunity in the host it is parasitizing, and this stimulation of immunity continues as long as the parasite remains inside the host's body, and controlling it leads to a balance in the immune response and any imbalance or decrease in immunity occurs. To reactivate the latent stages of the parasite present inside the host's body cells [15].

The current research results indicated an elevated the level of IL-17 in pregnancy women infected with the *Toxoplasma*, as the results agreed with many studies [16,17]. The results did not agree with the study [18], which indicated in his study a decrease in the level of IL-17 The reason for the increase may be attributed.

The immune response against the parasite was represented by an increase in the level of IL-17A, which acts as a cellular activator that initiates inflammation It recruits and attracts neutrophil cells to sites of inflammation, where they kill the parasite during the early stages of infection as an adaptive immune response [19].

This result is in agreement with the result of [20], They demonstrated that chemerin levels were elevated in the parasite-infected group.

The results found a direct effect of the *Toxoplasma gondii* parasite on the mechanism of action of the thyroid gland and its hormone levels, as it was found that infection with the parasite is associated with autoimmune diseases of the thyroid gland [21], which causes an increase in the levels of its hormones.

In another study, Al-Khamesi (2016) [22] found that there is a highly positive relationship between high thyroid hormones and infection with a parasite, as the parasite can be active and divide within the body, thus increasing thyroid hormones. The results are consistent with studies [23, 24], which indicated a decrease in the effectiveness of the enzyme glutathione peroxidase, and the reason for the decrease may be due to the presence of a stressful state, which may change a variety of functions of the cellular body. Moreover, the decrease in glutathione levels, especially in pregnant women with the acute stage. Toxoplasmosis represents a decrease in the ability to remove toxins in the uterus of the pregnant mother, resulting in accumulations of toxic substances and free radicals that threaten the life of the fetus [25].

On the other hand, the results of the research indicated a decrease in the effectiveness of the enzyme superoxide dismutase, and this is consistent with the results of [23, 24], as the reason for the decrease is attributed to the fact that its increase in this enzyme provides major protection against tissue injury resulting from the production of reactive oxygen species, and that neutrophils and macrophages release ROS as part of the explosion. Oxidative stress during infection with the *Toxoplasma* parasite, and controlling the generation of ROS by one of the antioxidant enzymes. Among them is superoxide dismutase, which detoxifies superoxide into hydrogen peroxide [26].

The results of the research found an increase in copper levels in women infected with the parasite, and the reason is attributed to an increase in the production of the protein ceruloplasmin through a zinc-dependent process, which may lead to the depletion of copper stores [27].

CONCLUSION

It was found that interleukin 17 and the hormone chemerin are linked to infection with *T.gondii*, while low levels of antioxidants may have a role in the development of infection with the parasite. As for the levels of thyroid hormones, they have a close relationship with the development of infection with the parasite in pregnant women infected with the parasite.

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