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Study the Relationship between the Levels of Some Adipokines and Toxoplasmosis in Women

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Annotation: Toxoplasma gondii is the parasite that causes toxoplasmosis, a disease that affects both humans and animals and is common in a variety of demographic groups. There is uncertainty and variance in patients' immunity due to T. gondii's dormant state. Thus, the purpose of this study was to determine the connection between female toxoplasmosis and the levels of specific adipokines. Between May and August of 2024, 140 subjects visited Azadi Teaching Hospital and Kirkuk Teaching Hospital. The experimental study was conducted in Kirkuk, Iraq, in private laboratories. A control group of fifty disease-free, healthy volunteers was also included. The results showed that the total of 140 blood sample collected from obese patient included in the study, 51(36.4%) was IgG positive. While 15(10.7%) was IgM positive, anti-T. gondii IgG and IgM seropositivity was found to be 3(2.1%) in patients. The findings showed that there is a strong association between obesity and infection with T. gondii in women, where it is noted that the group of women who weighed more than 30 kg/m2 had the highest infection, as the percentage of anti-T. gondii IgG reached 36 (70.6%) out of 51

positive results, and anti-T. gondii IgM reached 10 (66.7%) out of 15 positive results. chemerin showed significant (P≤0.05) elevated in Toxoplasma patients (3.84±0.13) compared with control group (1.67±0.19). Serum leptin showed significant (P≤0.05) elevated in Toxoplasma patients (51.04±4.61) compared with control group (8.49±1.43). Based on the results of the current study, a strong association was found between obesity and T. gondii infection in women. In addition, T. gondii infection led to increased levels of both chemerin and leptin.

Keywords: T. gondii, adipokines, leptin, adiponectin.

Introduction

Toxoplasma gondii is a protozoan parasite that causes toxoplasmosis, a zoonotic disease [1]. This species is a member of the internal coccidian parasite phylum Apicomplexa [2]. Animals, including livestock, as well as household pets are the usual carriers of this parasite [3]. The earth is home to this parasite [4]. It is a parasite that shares traits with the illness that causes malaria [5]. Even though T. gondii infects a sizable portion of the world's population, it hardly ever causes disease that is clinically significant [6]. In immunocompetent people, toxoplasmosis is frequently linked to brief, self-limiting infections and has no symptoms [7]. Studies on the age range of adolescents have been conducted. 48.5% of subjects in one of these trials, conducted in Italy between 1987 and 1991, showed IgG antibodies against T. gondii [8].56.3% of the participants in a different study of young Iranians had toxoplasmosis [9]. When schoolchildren in the suburbs of Islamabad were examined for lgG T. gondii antibodies, it was discovered that 17.4% of participants were impacted overall [8]. Toxoplasmosis has recently drawn a lot of attention in Iraq due to a number of studies. Adipose tissue functions as an endocrine organ, secreting a variety of signals that have increased glucose and lipid metabolism through a variety of methods. These signals include cytokines, growth factors, and protein hormones including leptin, adiponectin, and resisting. By producing adipokines, pro-inflammatory agents, and free fatty acids, adipose tissue hinders muscle adenosine triphosphate production and glucose metabolism [10]. Adipokines are bioactive compounds secreted by adipose tissue that have a variety of effects on health and disease [11]. Adipokines include molecules such as interleukin-6, adiponectin, and leptin [12]. Adipocyte tissues generate and secrete adipokines, such as chemerin and adiponectin [13]. The characteristic that distinguishes adiponectin from most other adipokines is its negative correlation with obesity. White adipose tissue is where it is mostly produced [14]. Adipose tissue is now known to be both a storage organ and an endocrine organ because of the production of several cytokines. Adipokines are involved in numerous processes both physiological and pathological in the human body. In addition to adipose tissue, chemerin is expressed by the liver, adrenal glands, the lungs, , the cartilage cells, the pancreatic gland, renal epithelial cells, and thrombocytes [15]. Therefore, this study was aimed to revealing the relationship between the levels of some adipokines and toxoplasmosis in women.

Materials & Methods

Patients

Between May and August of 2024, 140 subjects visited Azadi Teaching Hospital and Kirkuk Teaching Hospital. The experimental study was conducted in Kirkuk, Iraq, in private laboratories. Additionally, 50 disease-free, healthy volunteers served as a control group.

Sample collection

Using a sterile syringe, 5 ml of each patient's venous blood was extracted, and the sample was placed in sterile gel tubes. The blood was separated by centrifuging it for five to ten minutes at 3000 rpm. After that, the serum was divided into four Eppendorf tubes and stored at -20 C in a deep freezer until it was needed.

Ethical approval

According to the Native Ethics Group, these experiments were authorized, and each patient who took part gave their informed consent after being made aware of the investigation's goal.

Detection of Toxoplasma IgG and IgM by ELISA

These complexes include antigen-antibody pairings. The measurements were carried out using an IgG/ELISA kit and an IgM/ELISA kit from Sun-Long Biotech in China.

Estimating of some adipokinase

ELISA kits, from Sinlong, China, were used to quantify adiponectin. measuring serum leptin levels with the Leptin (sandwich) Enzyme Immunoassay Kit. This assay is only meant to be used for in vitro diagnosis.

Statistical analysis

A statistical application named Minitab was used to evaluate the data. ANOVA was used to examine the variation in the experimental group's means [16-17].

Results

Prevalence of Toxplasma gondii

Total of 140 blood sample collected from obese patient included in the study 51(36.4%) was IgG positive. While 15(10.7%) was IgM positive, anti-*T. gondii* IgG and IgM seropositivity was found to be 3(2.1%) in patients, as shown in table (1).

Table (1): Number and percentage of seropositivity of *Toxoplasma gondii*.

Parameters	IgG	IgM	IgG & IgM
Results	Positive	Positive	Positive
140 patients	51(36.4%)	15(10.7%)	3(2.1%)

Half of the individuals in the current study tested positive for anti-toxoplasma IgG, indicating a notably high overall seropositive rate. The results of Ali [18], who reported a 44.8% seropositive rate among 250 women from Kurdistan, Iraq, were not significantly lower than this one. Additionally, the finding was less than that of Mohammed and Al-Janabi's study [19], which found that 75 women from Iraq's Babylon area had a 42.6% seropositive prevalence. Numerous factors, such as sample size, regional variations, diagnostic methods, living circumstances, socioeconomic standards, and immunological status, are probably responsible for the variations in T. gondii seropositive rates [20].

Table (2) shows that there is a strong association between obesity and infection with T. gondii in women, where it is noted that the group of women who weighed more than 30 kg/m2 had the highest infection, as the percentage of anti-T. gondii IgG reached 36 (70.6%) out of 51 positive results, and

anti-T. gondii IgM reached 10 (66.7%) out of 15 positive results.

Table (2): Number and percentage of seropositivity of *Toxoplasma gondii*.

Parameters	IgG	IgM	IgG & IgM
18-24 kg/m^2	2(3.9%)	1(6.6)	0(0.0%)
25-30 kg/m^2	13(25.5%)	4(26.7)	1(33.3%)
More than 30 kg/m^2	36(70.6%)	10(66.7%)	2(66.7%)
Total	51(36.4%)	15(10.7%)	3(2.1%)

The outcomes showed that there is a strong association between obesity and infection with T. gondii in women, According to Carter [21], because T. gondii may reside in fatty tissues and change the distribution of inflammatory fat, infection may be linked to obesity. Furthermore, compared to pregnant women who were not infected, women who had toxoplasmosis were found to have increased gestational weight gain during pregnancy [22]. Additionally, in a mouse model of pregnancy that replicates human toxoplasmosis symptoms, excessive weight gain was found [23]. On the other hand, Picard et al. [24] suggest that T. gondii may contribute to weight gain by altering tissue lipoprotein lipase activity and decreasing muscle lipoprotein lipase during chronic toxoplasmosis, which increases the distribution of triglycerides in adipose tissues. Because some parasites have the ability to alter the host's leptin levels, food intake, and appetite, animal studies have shown evidence of a potential link between parasite survival and obesity [25]. It is commonly recognized that tissue cysts in practically every organ, including the brain, contain T. gondii bradyzoites. The amygdala and nucleus accumbens, two parts of the brain that are probably primarily targeted to impact fear signals in order to promote survival, are where brain cysts are most prevalent. These domains also impact behavior that is motivated by rewards, including eating habits [26].

Adipokines

Table (3) showed some adipokines parameters in groups of study. Whereas, chemerin showed significant (P≤0.05) elevated in Toxoplasma patients (3.84±0.13) compared with control group (1.67±0.19). Serum leptin showed significant (P≤0.05) elevated in Toxoplasma patients (51.04±4.61) compared with control group (8.49±1.43).

Table (3): concentrations of biochemical tests in groups of study

Groups / Parameters	Toxoplasma	Control
Chemerin (ng/ml)	3.84±0.13 a	1.67±0.19 b
Leptin (ng/ml)	51.04±4.61 a	8.49±1.43 b

* Non-significant (P≤0.05) differences are shown by the same letters, while significant (P≤0.05) differences are indicated by different letters.

In terms of leptin hormone results, patients' serum levels of the hormone are significantly higher than those of the second control group. It indicates that the increase in serum leptin hormone is significantly impacted by T. gondii infection. Our findings are consistent with the majority of research conducted on the same topic by Hassan et al. [27], Radia et al. [28], and Anandhan et al. [29]. Similar to the work by Facey et al. [30], leptin levels rose in proportion to both body fat and BMI. It has been found that taking the hormone leptin increases the likelihood of weight gain in obese individuals. Furthermore, The results of the current investigation demonstrated that those with positive anti-T. gondii antibodies had significantly greater chemerin levels. This finding supports the earlier finding regarding adiponectin. Adipocytes secrete the chemoattractant protein chemerin, an adipokine that is connected to a number of chronic inflammations and infections [31]. Teenagers with a high body mass index may develop metabolic syndrome as a result of T. gondii infection,

which may also be connected to pro-inflammatory cytokines, adipocytokines, and the metabolic connection. The dominant Th1-cytokine profile, which is defined by increased insulin synthesis, elevated proinflammatory adipokine levels that are mirrored by elevated serum chemerin levels, and IFN production as a marker of low-grade chronic inflammation, was used to illustrate this association [32]. This result is in line with that of [33], who demonstrated that the chemerin levels of the T. gondii IgG seropositive group were higher than those of the T. gondii IgG seronegative group.

Conclusions

Based on the results of the current study, a strong association was found between obesity and *T. gondii* infection in women. In addition, *T. gondii* infection led to increased levels of both chemerin and leptin.

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