



## Effect Toxoplasmosis on Thyroid Hormone

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**Abstract.** The study was conducted from January 2021 to March 2022. The study included samples of female patients arriving at some private laboratories in Samarra. The study included (50) serum samples from women arriving at health centers. The study groups were divided into two groups of women, the first group included (35) serum samples from pregnant women who suffered from previous miscarriages, and the second group was the control group, which included 15 samples from healthy women. Blood samples were collected in a volume of (5) ml in clean dry tubes and placed in an incubator at 37°C for (5) minutes, then the coagulated fraction was separated from the clear solution using a centrifuge at a speed of (2000 cycle/min) for (15) minutes. The clear solution represents the blood serum that was drawn using a micropipette, which was divided into (7) parts using plastic tubes, then the samples were kept at a temperature of 20 °C until the required tests were performed on them. Concentrations of thyroid hormone, (T3), (T4) and (TSH), were measured by used the equipment of all test.

**Keywords:** Thyroid hormones, Toxoplasmosis, Tsh, T3, T4

### 1. INTRODUCTION

Toxoplasma gondii is the most widespread parasitic protozoa and an liable for some of the most destructive common diseases of humans [1], classified in the phylum Apicomplexa and coccidian class [2]. This parasite accesses the host through the digestive system due to consuming contaminated food or drink with oocysts. Additionally, it can be transmitted through the consumption of undercooked or poorly cooked meat containing tissue cysts. A crucial means of transmission is through transplacental [3].

The parasite's life cycle consists of three essential stages: Rapidly replicating tachyzoites, slowly replicating bradyzoites with in tissue cysts, and sporozoites inside oocysts within egg sacs [4]. Toxoplasmosis, a globally prevalent parasitic infection, varies in prevalence worldwide, with approximately one-third of the world's population at risk. In immunocompetent individuals, infection is usually asymptomatic, while in immunocompromised individuals, such as pregnant women and those with HIV, symptoms vary depending on the host type.

Clinical symptoms in cats may include dyspnea, polypnea, jaundice, and abdominal discomfort [4]. Congenital toxoplasmosis in humans can lead to diverse clinical symptoms,

including abortion, mental retardation, blindness, hydrocephalus, and congenital anomalies [5]. Thyroid gland produce two necessary thyroid hormones into blood stream, the first one called thyroxine (T4) and the other called triiodothyronine (T3) [6]. T3 & T4 are synthesized from iodine and tyrosine, they elevate optimal growth, development, function and conservation of all body tissues. The synthesis and secretion of these hormones effect by a hormone released via the pituitary gland called Thyroid – Stimulating Hormone (TSH), also this gland produce calcitonin which plays a role in calcium homeostasis [8], the abnormal thyroid function has multiple effect for public health, because it construct and stores hormones which are help regulate the heart rate, body temperature, blood pressure, body weight and cholesterol [7]. In addition to the thyroid hormones are necessary for the function of every cell in the body [8]. The purpose of this study is to confirm the relationship between thyroid hormones levels and toxoplasmosis aborted women in samarra City.

## 2. MATERIALS AND METHODS

The study conducted for the period of January 2021 to March 2022. had included 50 samples of pregnant women aged (15-45 years old) admitted the primary health care center of state hospitals or referred to private laboratories in samarra. An intravenous blood samples of 10 mL of each woman were collected using disposable syringes. Samples within special laboratory tubes were centrifuged for 15 minutes/3000 cycles/minute. The sera, using micro-pipettes, were then divided into 2 parts: (1). 1 mL of the serum is placed inside a 5mL sterile plastic tubes, tagged and placed inside freezer at -20<sup>0</sup>C degrees to preserve in case of re-examination; (2). The remaining serum is kept in free of any anticoagulant plastic plain tubes to conduct both IgG antibody detection, IgM to *Toxoplasma* parasites and for hormonal tests. Using micropipette, 50  $\mu$ L of serum was taken and added to the Cassette test strip. The results were read after 20-15 minutes by observing the tape and the red mark appeared in front of IgG or IgM. The concentration of the Tsh,T3,T4 hormone was estimated by following the instructions of the manufacturer and using the ELISA technique

### 3. RESULTS & DISCUSSION

#### 1- The relationship between age and infection

In the current study, 65 samples were examined, and the number of samples infected with toxoplasmosis conidia was 31 samples, at a rate of (47.6%). The highest age group infected with toxoplasmosis conidia was (25-30 years), at a rate of 64.2%, while the least age group at risk of infection was ( 15-20 years if the infection rate is 12.5% as in Table (1)

These results were consistent with a number of researchers in different regions of the world, as the infection rate was high in the age group (25-37) years (9,10,11)

**Table (1)The total number of samples tested and the infection rate for each age group**

| Age group | Number of samples tested | Number of infected samples | %    |
|-----------|--------------------------|----------------------------|------|
| 15-20     | 8                        | 1                          | 12.5 |
| 20-25     | 19                       | 11                         | 57.8 |
| 25-30     | 14                       | 9                          | 64.2 |
| 30-35     | 17                       | 7                          | 41.1 |
| 35-40     | 7                        | 3                          | 42.8 |
| Total     | 65                       | 31                         | 47.6 |

The results of the current study differed with the study of (12)who indicated that the highest category of infection with the toxoplasmosis conidia parasite is (30-39 years of age) and with (13), as the overall infection rate is very low.

The results of the current study are consistent with what many researchers have indicated, as this age stage is the appropriate period for childbirth, and this leads to the seriousness of the disease because it is known to cause the infection to be transmitted from the placenta to the fetus or to cause congenital malformations if the infection occurs in the last period of pregnancy.

## 2-Determination of the specific IgM and IgG index in the serum of women infected with toxoplasmosis

The number of samples infected with *Toxoplasma gondii* in this study was 31 samples, where the positive percentage for IgM results was 21.5%, while the positive percentage for IgG was (26.1%) shown in Table (2). The serological detection of antibodies specific for *Toxoplasma gondii*, specific IgM and IgG, is One of the distinctive ways to diagnose acute and chronic toxoplasmosis in humans is that the IgM antibody begins to rise rapidly from the first week of infection and then begins to gradually decline and completely disappear from the serum.

**Table. 2 incidence rate according to type IgG or IgM**

| Age group | Number of samples tested | Number of infected samples | IgG | %    | IgM | %    |
|-----------|--------------------------|----------------------------|-----|------|-----|------|
| 15-20     | 8                        | 1                          | 1   | 12.5 | 0   | 0    |
| 20-25     | 19                       | 11                         | 5   | 26.3 | 6   | 31.5 |
| 25-30     | 14                       | 9                          | 5   | 35.7 | 4   | 28.5 |
| 30-35     | 17                       | 7                          | 4   | 23.5 | 3   | 17.6 |
| 35-40     | 7                        | 3                          | 2   | 28.5 | 1   | 14.2 |
| Total     | 65                       | 31                         | 17  | 26.1 | 14  | 21.5 |

The study converged with a number of researchers inside the country, such as (14) in Kirkuk, where the total infection rate in non-pregnant women using the ELISA IgG technique was 22.5%, and with (15) in Dhi Qar Governorate, the IgG rate reached 27.5%. The researcher (16) in the city of Tarmiyah, north of Baghdad, recorded a lower percentage of IgM in women infected with the parasite than IgG, as the percentage of IgG antibody was recorded at 21.4%, and in Kirkuk, he recorded 21.9% IgM (17), while it was recorded ( 18), in Kirkuk, 28.8% and in Tikrit (19) recorded an IgM of 26.67%, while the researcher( 20) in Iran recorded an IgG rate of 23.4%, and with (21) in Turkey, an IgG rate of 24.6%, as for Pakistan. They recorded the percentage of IgM antibodies at 24.8% in (22)

.The study differed with the study of (23) in Dhi Qar Governorate, if the percentage of IgM was found to reach 40%. And with (24) in the city of Najaf, there was a percentage of 70% for the IgG antibody and (30%), while the samples Which gave a positive result for antibodies,

IgM, while it was recorded (25) in Salah al-Din Governorate, where it reached (5.41%) IgM, while 33.3% appeared positive for IgG.

The study found the highest percentage of IgG antibodies in the age group (25-30), while IgM in the age group (20-25). The reason for the increase in antibodies in these two groups, which is considered the working age group and which may be exposed to more sources of pollution, and that most women In the current study, this category included those who visited health institutions and doctors for the purpose of care during pregnancy and to ensure that they were not infected with diseases that put the mother and fetus at risk.

The reason may be due to hormonal changes during pregnancy, which leads to a decrease in immunity in the pregnant woman and thus an increase in the infection rate, in addition to her responsibilities or household chores, her increased dealing with cleaning and working in agricultural fields, the lack of health awareness among women who suffer from miscarriage, and the lack of understanding of the condition, which may be interpreted as Accidental miscarriage or for an unknown reason, or failure to detect the medical condition by the obstetrician and their acceptance of the second pregnancy without treatment, as it causes repeated miscarriages. The discrepancy in infection rates is due to the difference in the number of samples examined in each study and the difference in study areas, as well as the difference in health habits and culture. Among the regions studied, the reason for the concentration of infection within the group of women at these ages is due to the optimal period for marriage and childbearing among most women in the eastern countries, including Iraq, in addition to direct contact with soil and eating undercooked meat and contaminated fruits and vegetables that carry the infective phase of the parasite, including: In some of its stages, the disease takes the form of a subclinical infection. Women, even if they are infected, do not detect the infection, or they may reach menopause and do not become pregnant or give birth, as pregnancy is the main condition that reveals *Toxoplasma gondii* infection through the clinical conditions to which the mother is exposed. And the fetus during infection with toxoplasmosis through miscarriages and congenital malformations of newborns resulting from the infection in most cases. (26)

### 3- Thyroid hormone levels

**Table (3): Levels of TSH hormones in all study groups**

| Parameters<br>Groups | TSH (ng/ml) |
|----------------------|-------------|
| Toxoplasma           | 9.52±2.15 a |
| Control              | 4.15±1.48 b |

Similar letters indicate moral difference at  $p \leq 0.005$

**Table (4): Levels of T3 hormones in all study groups**

| Parameters<br>Groups | T3 (ng/ml)  |
|----------------------|-------------|
| Toxoplasma           | 7.20±1.53 a |
| Control              | 5.08±1.22 b |

Similar letters indicate moral difference at  $p \leq 0.005$

**Table (5): Levels of T4 hormones in all study groups**

| Groups     | Parameters | T4 (ng/ml)  |
|------------|------------|-------------|
| Toxoplasma |            | 8.9±1.43 a  |
| Control    |            | 7.45±2.81 b |

Similar letters indicate moral difference at  $p \leq 0.005$

The results of the current study showed an increase in the levels of TSH, T3, and T4 in the group infected with the parasite, reaching (9.52±2.15, 7.20±1.53, 8.9±1.43) compared to the control group (4.15±1.48, 5.08±1.22, 7.45±2.81). In table (3,4,5)

The current study agreed (27). Also (28) found a high positive relationship between high thyroid hormones and infection with the toxoplasmosis conidia parasite. The researcher found that there is a direct relationship between the destruction of thyroid tissue as a result of infection with the *Toxoplasma gondii* parasite, as this parasite has the ability to be active and divide within the thyroid tissue, which causes a malfunction of the gland and an increase in the level of hormones, as the thyroid gland helps regulate growth as well as the rate of chemical reactions (metabolism) in the body and there is a high relationship between damage to the thyroid gland and the *Toxoplasma* parasite, due to the direct involvement of the thyroid gland by *Toxoplasma gondii*, and the multiplication and spread of this parasite in the thyroid tissue changes and the subsequent change in thyroid hormones, may also be due to the reactivation of latent toxoplasmosis. Which may continue after or within 6 months of recovery from the first infection with toxoplasmosis. The parasite may cause the secretion of nerve stimulants to the hypothalamic and pituitary thyroid axis to accelerate the proteolysis of thyroglobulin, leading to the release of thyroid hormones such as triiodothyronine T3 into the blood within 30 days.

Minute [29].

In addition, when *Toxoplasma* reaches the hypothalamus it alters its stimulation, leading to distracted TSH secretion as well as abnormal production of T3 and T4. In addition, T4 responses are clearly diminished in magnitude, reflecting a lack of reserves.

T4 is a hormone that can be easily obtained, because the synthesis, storage and release of T4 depends on the thyroid gland being stimulated by TSH.( 30)

It differed with the study conducted by (31), which indicated a significant increase in TSH levels with a decrease in T4 and T3 levels compared to the control group, as well as with (30). With a study conducted by (32) they indicated that there is no effect between the thyroid gland and *T. gondii* infection, and no defect was detected in the work and levels of thyroid hormones. The reason may be that this infection has no role in the weakness of the thyroid gland, or that this infection has a role. Preventative against thyroid dysfunction, the researcher stated that it is possible that the parasite may infect the thyroid gland in a very small number of individuals infected with this parasite, and therefore any inflammation or damage to the thyroid tissue is rarely detected. On the other hand, it is not clear whether the toxoplasmosis conidia parasite has a protective role against thyroid dysfunction (33).

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