Effects of Infection with Toxoplasma Gondii to the Levels of Thyroid Hormones
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INTRODUCTION
The Toxoplasma gondii is a parasitic protozoan that can infect many types of hosts like mammals, birds and humans causing toxoplasmosis (La Hoz et al., 2019) which forces intrusive intracellular. The infection is transmitted by the parasites of conic toxoplasms, in the form of parasite egg sacs in several ways, including drinking water, eating vegetables and fruits contaminated with parasite egg sacs, and contamination by the feces of feces that are infected with contaminated soil. Well, an important means of transmission is the occurrence of transplacental infection (Robert and Darde, 2012) placenta.

The parasite can attack different organs, for example, the thyroid gland, which is one of the most important endocrine glands in the body, as its hormones (T4, T3) have an important role in regulating the body's basic metabolic rate and the generation of heat, and contribute to fat metabolism by stimulating lipolysis, production Fatty acids as an energy source (Zhang, 2020).

Any dysfunction in the thyroid gland has many effects on the various metabolism processes in the body, and there are many cases for that. The most common of which are Hypothyroidism, including low levels of hormones (T4, T3) and a high level of TSH. It is a common disease in adults, especially in women, and most cases of hypothyroidism in adults are caused by immune destruction of the gland tissue, as in the case of Hashimoto's disease and other cases caused by Congenital children. It occurs as a result of a lack of iodine in the food or as a result of radioactive iodine gland treatment or after Gland surgeries (Wu, 2015). The purpose of this study is to confirm the relationship between levels of thyroid hormones, calcitonin, some electrolytes, and abortive toxoplasmosis in Samarra.

MATERIALS AND METHODS
Collection of samples
The current study included the collection of 300 serum samples, which collected during the period from July 2019 to January 2020. Serum samples was obtained by withdrawing 5 cm³ of venous blood by using a disposable syringe and placed in sterilize plain tubes with a cover tightly without anticoagulants, centrifuge for 10 minutes at a speed of 3000 rpm, after the tubes were left at room temperature 25° C until coagulation. After that the serum was pulled by the micropipette and placed in clean, sterile tubes and kept in a freezing state at -20° C until performing the tests under study.

Study design
The head groups were divided into four groups: (toxoplasma, hypothyroidism, hyperthyroidism, and control).

To investigate the class IgM antibody of the Condylopaque parasite, enzyme-linked immunosorbent technique (ELISA) was used by using standard method manufactured by (German Human), otherwise the determination of serum hormones were done by ELISA technique to measure the level of TSH, T3, T4 and calcitonin concentration Kits, provided from German Human Company.

Statistical analysis
The results obtained from the current study were analyzed using the SPSS statistical program, and the Dunkin polynomial test was used to compare four groups at the level of significance (P<0.05) to identify the degree of significance of the differences between the groups rates.
RESULTS AND DISCUSSION

Thyroid hormone levels

The results of the current study showed an increase in the levels of TSH, T3, and calcitonin (11.13 ± 0.05 and 6.18 ± 0.63 and 93.5 ± 4.2 respectively) in the CTD group compared to the control group (3.194 ± 1.37, 3.06 ± 0.81 and ± 71.3 ± 6.32, respectively) with a significant decrease (P <0.05) in T4 levels (4.8 ± 1.582) compared to the control group (6.39 ± 1.771). On the other hand, there was an increase in TSH levels (11.17 ± 6.05) in the group of hypothyroidism compared to the control group, with a significant decrease in the levels of T4, T3, and calcitonin (4.02 ± 1.01, 1.68 ± 0.58 and 48.3 ± 5.17) compared to the control group. Significant decrease was found (P <0.05) in TSH levels (20.13 ± 7.65) in the hyperthyroidism group with a significant increase (P <0.05) in the levels of T4, T3 and calcitonin (4-9) compared to the control group and in Table (2) and figures (M -1, 2, 3 and 4). Regarding the differences between groups with toxoplasma and normal performance of the thyroid gland compared to two groups affected by Toxoplasma, but the group of hypothyroidism and the group of hyperthyroidism found the results that the parasite infection increased to levels of TSH and T3 with low levels of T4, which showed significant difference compared to the group Hypothyroidism & Toxoplasma with a decrease in high. Compared to the Toxoplasma group with normal thyroid performance in T4 levels, there were no differences between the two groups in TSH and T3 levels while significant differences were found in TSH and T3 levels between Toxoplasma group and Hyperthyroidism & Toxoplasma group as shown in the table below.

Table 1: Mean±S.D. of thyroid hormones levels in sera of groups under investigations

| Parameters | Groups | TSH (ng/ml) | T4 (ng/ml) | T3 (ng/ml) | CT. (ng/ml) |
|------------|--------|------------|------------|------------|-------------|
| Control    |        | 3.19±1.37  | 6.39±1.771 | 3.06±0.81  | 71.3±6.32   |
| Toxoplasma |        | 11.13±1.05 | 4.8±1.582  | 6.18±0.63  | 93.5±4.2    |
| Hypothyroidism |        | 11.17±3.05 | 2.02±1.01  | 1.68±0.58  | 48.3±5.17   |
| Hyperthyroidism |    | 20.13±0.65 | 7.41±1.14  | 10.24±4.57 | 86.8±7.5    |
| Hypothyroidism & Toxoplasma | | 13.25±2.51 | 4.95±0.86  | 3.28±0.37  | 41.9±6.28   |
| Hypothyroidism & Toxoplasma | | 7.13±1.9   | 6.18±1.73  | 9.4±2.53   | 101.8±9.4   |

In TSH levels (20.13 ± 7.65) in the hyperthyroidism group with a significant increase (P <0.05) in the levels of T4, T3 and calcitonin (4-9) compared to the control group and in Table (2) and figures (M -1, 2, 3 and 4). Regarding the differences between groups with toxoplasma and normal performance of the thyroid gland compared to two groups affected by Toxoplasma, but the group of hypothyroidism and the group of hyperthyroidism found the results that the parasite infection increased to levels of TSH and T3 with low levels of T4, which showed significant difference compared to the group Hypothyroidism & Toxoplasma with a decrease in high. Compared to the Toxoplasma group with normal thyroid performance in T4 levels, there were no differences between the two groups in TSH and T3 levels while significant differences were found in TSH and T3 levels between Toxoplasma group and Hyperthyroidism & Toxoplasma group as shown in the table below.
The results of the current study showed a direct effect of the Toxoplasma gondii parasite on the mechanism of the thyroid gland and the levels of hormones produced by the thyroid gland. A study conducted in the city of Kirkuk showed that the cause of increased infection with toxoplasmosis parasites was the continuous power outages, one of the reasons that affect the storage of food and water supplies in addition to the absence of pesticides of approved quality to eliminate mechanical carriers. All of these factors may have played an important role in highlighting the reason for the high incidence of toxoplasmosis in the province (Salman and Mustafa, 2014). Liu and his group (1994) confirmed in their study the diagnosis of T. gondii phases in the thyroid gland. The infection of the CDI parasite is associated with autoimmune thyroid disease (Shapira et al., 2012), which causes a slight rise in the levels of thyroid hormones (Wasserman et al., 2009) and this corresponds to the results of the current study. The results of the current study did not coincide with a study conducted by A Alcarado-Esquível and his group (2019) who indicated the negative relationship between the thyroid gland and T. gondii infection as no defect was detected in the work and levels of thyroid hormones and the researcher instructed the cause as follows: that these infections have no role in hypothyroidism, or it has a protective role against hypothyroidism. If the researcher indicated that it is possible that T. gondii may affect the thyroid gland in a very small number of individuals with this parasite and therefore any inflammation or damage to the thyroid tissue is rarely discovered. On the other hand, it is not clear whether the CBD parasite has a protective role against thyroid dysfunction (Alcantara-Neves et al., 2012).

In another study conducted by researcher Al-Khamesi (2016) he found a high positive relationship between elevated thyroid hormones and infection with the toxoplasmosis of Kennedy toxoplasmosis. The researcher found there is a direct relationship between the thyroid tissue breakdown as a result of the infection with the Kennedy toxoplasmosic parasite, as this parasite has the ability to activation and division within the thyroid tissue, which causes an imbalance in the gland’s work and high levels of hormones. If the researcher finds that the levels of T3 and TSH hormones are high by (12.74 ± 0.53 and 11.64 ± 0.58 mIU / L, respectively) compared to the control group (1.49 ± 0.16 and 2.29 ± 0.25, respectively), this corresponds to the results of the current study.

And Al-Khamesi (2016) indicated that the incidence of toxoplasmosis toxoplasmosis leads to an increase in TSH levels, which is reflected in the performance of the parathyroid gland which causes high levels of the hormone calcitonin. This explains the results of the current study. On the other hand, it was found that infection with parasitic diseases leads to deficiency and disorder of parathyroid gland hormones, where schistosomiasis and fascioliasis work on excessive levels of calcium hypercalcemia with high levels of the hormone and parathyroid protein PTH-related protein with low levels of the hormone calcitonin (Kilany et al., 2009; Yasri and Wiwanitkit 2018). On the other hand, in a study conducted by Wu and his group (2016), the researcher found that infection with parasites in general is protozoal and worms that led to a defect in thyroid hormones and a thyroid disorder in its work if it found a decrease in calcitonin levels and an increase in the thyroid hormone, and this corresponds to the results of the study The current in that the parasitic infection leads to an imbalance in the functioning of thyroid hormones and low levels of the hormone calcitonin.

In the current study, a significant increase in TSH levels was found with a decrease in the levels of T4, T3 and calcitonin compared to the control group in hypothyroidism patients and these results are consistent with the results of the study conducted by Hashim and his group (2018), which indicate a significant increase in TSH levels with a decrease in T4 and T3 levels compared to the control group. Furlanetto and his group (1991) indicated a decrease in the levels of the hormone calcitonin in patients with hypothyroidism and this corresponds to the results of the current study.

With regard to the incidence of Toxoplasma and its relationship to the condition of Hypothyroidism, the results showed an increase in the levels of T4 and T3 in the Hypothyroidism & Toxoplasma group compared to the Hypothyroidism group only, and what may explain the reason for this result in the current study is that infection with the parasitoid toxoplasmosis motivates the nervous system causes the stimulation of hypothalamus-pituitary thyroid axis and this leads to an increase in TSH levels and thus an increase in the secretion of triiodothyronine (T3) (Barrett et al., 2010). This enhances the results of the current study in terms of the high levels of calcitonin T3 and TSH in the current study. On the other hand, Eisa and his group (2019) indicated that the infection of the KCI parasite leads to high levels of T4 and T3 in Hypothyroidism patients, and the researcher stated that the mechanism is not clear until this moment.

In addition, a significant decrease in TSH levels was found with an increase in the levels of T4, T3 and calcitonin compared to the control group in patients with hyperthyroidism. These results are consistent with the results of the study conducted by Aday (2014), which indicated significant decrease in TSH levels with high in T4 and T3 levels compared to the control group. Ferreira-Vinbuena and his group (1991) indicated higher calcitonin levels (193.6 ± 8.62 pg / ml) compared to the control group (7.61 ± 116.7) in people with hyperthyroidism and this corresponds to the results of the current study.

CONCLUSIONS
A disorder of thyroid hormones in people with toxoplasmosis; The presence of a correlation between infection with the parasitoid toxoid plasma and a decrease in the hormone calcitonin in patients with Hypothyroidism; Combating rodents as intermediate hosts and cats as intermediate and final hosts, and destroying tissue residues in reed stores in a healthy manner ensuring that cats do not reach them.

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