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Research Article



## Evaluation of the effect of *Toxoplasma gondii* on some reproductive hormones in females

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### Abstract

Toxoplasmosis is a common disease in worldwide. It is considered one of the common grounds between Humans and animals (zoonosis), which is caused by the *Toxoplasma gondii* parasite. Between (30-60%) of the world's population, the most important cause of infection with the parasite is eating uncooked meat. And unwashed vegetables that are contaminated as well by touching the feces of infected cats, as most of the infected people are. With this type without symptoms or they do not show obvious symptoms, early pregnancies are severe, accompanied by infection leading to spontaneous abortion, hydrocephalus, and mental retardation, while transmission rates are high. Highest During the third trimester, a third of all cases of ocular toxoplasmosis occur before birth. It is possible that it occurs after birth, and that this disease is congenital, possessing a parasite *Toxoplasma gondii* is a characteristic that distinguishes it from other opportunistic parasites, as it parasitizes on many types of hosts. This makes it spread widely) and attack various organs, but mainly it attacks the nervous system Central and Reticuloendothelial System, For over 60 years. Pyrimethamine has been combined with Sulfadiazine, a classic drug, which has a synergistic effect on different steps in the synthesis of DNA in the toxoplasmosis parasite. The study was conducted from April 2022 to March 2023, where 160 creative women were collected from the new arrivals women between the ages of (20 and 40 years) and admissions to primary health care centers in government projects or referrals to private laboratories in Iraq, After it was determined that 25% of pregnant women infected with pathogens, while 75% of pregnant women were healthy from this parasite, and the percentage of parasite infection in the age group 20-30 years was 25%, while the percentage was 75% in age group was 30-40, the percentage of women infected with toxoplasmosis by place of residence was 37.5 in urban while 62.5 in village. The percentage of women infected with toxoplasmosis who keep cats and pets is 70% while 30% are without animals. The results of the current study showed that there were significant differences in the results of luteinizing hormone and follicle-stimulating hormone between women infected with *Toxoplasma gondii* and women in the control group.

**Keywords:** *Toxoplasma gondii*, LH, FSH, Pregnant Women.

### Introduction

Toxoplasmosis is a disease caused by the parasite *Toxoplasma gondii*. Which are several mammals and some birds as intermediate hosts for this parasite that infects humans and both sexes, and cats represent the final hosts for the parasite. The parasite belongs to the order Sporozo, which includes, a large group of primary parasites of great health importance due to their wide spread in the environment and their parasitism on a spectrum wide range of hosts, including humans (Dubey, 2020; Marques et al., 2020).

In addition to being a serious and life-threatening disease, especially in pregnant women and people suffering from immunodeficiency diseases. Toxoplasmosis is an infectious disease that spreads all over the world and its danger lies in the death of many individuals. Infected animals may carry the parasite and not show any symptoms, except when a decrease in the level occurs. Immunity in the body, so the acute picture of the disease appears (Nogareda et al., 2014; Matta et al., 2021). One of the most common causes of infection with this parasite is eating poorly cooked and immature meat, as it contains cysts within its fibers, and these cysts are filled with

parasite eggs that contaminate water or food when cats are dealt with or contaminated with their feces (Almeria et al., 2021). When a woman is infected with this disease, it is transmitted when it is carried through the placental blood, and the infection is transmitted directly from the mother to the fetus, which in most cases causes miscarriage and death of the fetus, and in some cases congenital deformity of the fetus, and in very few cases the infection occurs to humans when blood is transfused to him or some organs are transplanted (López et al., 2021; Nayeri et al., 2021). A symptom of this disease is lymphoma, body aches, High temperature, headache, Muscle pain, and Skin rash (Stelzer et al., 2019). The present study aims to evaluate the level of luteinizing hormone (LH) which is produced by gonadotropin cells and which LH acts to stimulate ovulation and maintain the corpus luteum and progesterone secretion. and follicle-stimulating hormone (FSH) in pregnant women in Samarra city.

**Materials and methods**

The study was conducted from April 2022 to March 2023, where 160 creative women were collected from the new arrivals women between the ages of (20-40 years) and admissions to primary health care centers in government projects or referrals to private laboratories in Iraq. A blood sample was collected intravenously and 5 ml from each female using a medical syringe. Work was continued inside the private laboratory for 15 min. 3000 cycles/min. The sera were then divided, using micro dimensions, into two parts:

- (1) 1 mL of serum is placed inside plastic tubes with a 2 mL top, and labeled. Freezer at -200 °C for re-keeping in pen case;
- (2) Serum is completely eliminated from any rapid surgery to cover all detected IgG and IgM antibodies to Toxoplasma parasites, highlighting the body burn.

Using the microdialer, 50 µL of serum was taken and added to the test cassette. Results were read after 1-5 min 20 by tape note and the forward red flag IgG or IgM appeared. Only LH was concentrated on following the company's wonderful instructions (Clark et al., 1986). FSH was evaluated using the procedure dictated by the manufacturer and using ELISA technology.

**Results**

It was determined that 25% of pregnant women were infected with pathogens, while 75% of pregnant women were healthy from this parasite Table 1. and the percentage of parasite infection in the age group 20-30 years was 25%, while the percentage was 75% in age group was 30-40 Table 2. the percentage of women infected with toxoplasmosis by place of residence was 37.5 in urban while 62.5 in village Table 3. the percentage of women infected with toxoplasmosis who keep cats and pets 70% while 30% without animals Table 4. The results of the current study showed that there were significant differences in the results of luteinizing hormone and follicle-

stimulating hormone between women infected with *Toxoplasma gondii* and women in the control group Table 5.

**Table 1. The percentage of women infected with toxoplasmosis**

Groups	Numbers	percentage
+ Toxoplasma	40	25%
_ Toxoplasma	120	75%
Total	160	100%

**Table 2. The percentage of parasite infection in the age group**

Age	Numbers	percentage
20-30	10	25%
30-40	30	75%
Total	40	100%

**Table 3. The percentage of women infected with toxoplasmosis by place of residence**

Groups	Numbers	percentage
Urban	15	37.5%
Villages	25	62.5%
Total	40	100%

**Table 4. The percentage of women infected with toxoplasmosis who keep cats and pets**

Groups	Numbers	percentage
There are animals	28	70%
There are no animals	12	30%
Total	40	100%

**Table 5. The hormonal changes of toxoplasmosis-infected women**

Parameters Groups	LH mUI / mL	FSH mUI / mL
Control	4.532 ± 1.083	2.01 ± 0.55
Patient	12.9 ± 1.4	6.0 ± 1.2

**Discussion**

Acute infection with Toxoplasmosis usually is asymptomatic in healthy adults while people may have a few weeks or months of mild. In infected women it may lead to development of cysts in ovary or other organs causing further damage to the body systems. This research involved a wide age range of fertile women at age 15 up to menopause 45 years old in Iraqi society (Dubey et al., 2021; Mammari et al., 2019). In Iraq the motivation for health checkup involves routine hygienic test for all women particularly during the pregnancy. Most infected women involved in this research

were from middle class families who spend daily extra time in the kitchen in preparing food which requires tasting the undercooked meat during preparation and un washed vegetables containing parasitic ova (Bottari et al., 2019).

Similar research was carried out worldwide depending on various factors i.e. standard of life, health condition, levels of education, environmental conditions, and subtle gender-dependent behavioral changes in immune-competent humans. Such latency exerts extra care upon all women and health authorities for a compulsive test for every woman on annual levels (Liempi et al., 2019).

The reason for the higher prevalence of toxoplasmosis between urban and rural might be due to random sample collection and to the widespread of unlicensed road chef shops in the town than in rural where people prefer to have food indoors rather than outdoors. The pets are not subject to general health checkups by veterinary doctors particularly those in urban areas may contribute to differences in infection between rural and urban women. Public awareness seems a must by the national health authorities to raise the attention of pet owners to the risk of infection (Holec et al., 2022; Sana et al., 2022).

The present study showed that in Samarra city the rate of infection with *T. gondii* in pregnant women was only 25% which is inconsistent with another Iraqi city, Thi-Qar 22.2%, but varied in other national surveys 30% rate in Najaf 27,41% in Anbar (Marín et al., 2022). These records were higher than in two other national surveys Kerkuk (Li et al., 2022) and in Thi-Qar cities 30 while were contradictory with other Iraqi provinces e.g. Kut31, Baghdad, Diawniyah33, and Mosul34. Variations in the age ranges of the infected Iraqi women, in comparison with other national studies, may also refer to the social and cultural mentality where some women do not disclose their real ages to hospital authorities (Zhang et al., 2022). Such disclosure of real ages by Iraqi women may inevitably cause a real impact on national biostatistics measurements. Contradiction in the outcome also may indicate that these studies were conducted on a group of women who had no prior diagnosis of parasitic infection in addition to relatively small group numbers. Moreover, variation in national surveys may be attributed to ignorance of health check-ups by Iraqi pregnant women which imposes a general compulsory health checkup by the health authorities leading to an obligatory early registration of pregnancy, continuous national checkup survey, and central record of each individual since birth to provide the WHO's with true information (Marangi et al., 2022).

There is relevant evidence that steroid hormones affect the course of toxoplasmosis in humans and mice demonstrated that the immune and brain inflammatory responses of female mice were more than male mice following infection with *T. gondii*. Such inflammatory differences indicate the presence of species and gender susceptibility differences between toxoplasmosis (Fallahi et al., 2018).

The prevailing hypothesis for immunological differences between the sexes is that sex hormones, particularly, testosterone, 17  $\beta$ -oestradiol, and progesterone, influence the immune system<sup>36</sup>. The significance in the levels of LH with a decrease in levels of FSH in the patients with toxoplasmosis refers to a direct correlation between toxoplasmosis and these sex hormones in pregnant women which may suggest a reliable tool for diagnosis of health condition and check the immune system (Arshad, 2018).

The present results demonstrated the distribution of infection by antibodies was higher (60%) for IgM in acute infection while the antibody IgG reached 40% and the highest percentage recorded at age 35-40 years old. The rise in the levels of these two antibodies confirms the infection status of the women. Further physiological and biochemical experiments to explore such correlation are required to address the causes of abortion in pregnant patients infected with toxoplasmosis compared to healthy women (Shi et al., 2018).

## Conclusion

Toxoplasmosis is one of the common diseases between humans and animals This disease affects between (30-60%) of the world's population. The most important cause of infection with the parasite is eating uncooked meat and unwashed vegetables that are contaminated Also by touching the feces of infected cats. The spread of the disease is frequent in warm and humid areas, and the epidemiology of the disease is due to the nature of the nutrition of the population and their density . The ability of the parasite to infect many types of animals, especially mammals. Before humans increased the possibility of spread. Most cases of transmission are through eating undercooked infected meat.

## Conflict of Interest

The author hereby declares no conflict of interest.

## Consent for publication

The author declares that the work has consent for publication.

## Ethical Considerations

The study was approved by the institutional ethical committee.

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