

A Study of the Change in the Concentrations of FSH and LH Hormones and the Interleukines 12 IL-12 and Interferon IFN- γ in Pregnant and Aborted Women with Toxoplasmosis in Salah al-Din Governorate.

Rawan Hasan Mohammed Al-Hamdani^{1*}, Intisar Ghanim Abdulwahhab²

1-Tikrit University /College of sciences/ Department of Biology/Iraq

2-Tikrit University / College of Education for Women/ Department of Biology/Iraq

* Ra96hasan2020@gmail.com

Abstract

In this study, 60 blood samples were collected from pregnant and aborted women infected with Toxoplasmosis, while 30 blood samples were collected from non-infected women. 5 ml of venous blood was collected and placed in SST (Serum Separating Tube) tubes for 10-15 minutes to separate the serum before centrifuged for 10 minutes at 3500 rpm. FSH and LH concentrations, as well as IL-12 and IFN- γ kinetics, were measured using ELISA. The study's findings revealed a rise in the concentrations of IL-12 and IFN- γ , which were (10.17 \pm 0.20 pg/ml) and (8.67 \pm 0.18 pg/ml) in the affected women, respectively. It was also discovered that the concentration of IL-12 did not change between the two age groups (20-30) and (40-31) for female patients, where it reached (10.15 \pm 0.25) and (10.32 \pm 0.33) pg/ml, respectively, whereas the high concentration of IFN- γ was recorded within the age group (40-31) for female patients, which amounted to (9.61 \pm 0.51pg/ml) compared to its concentration in the age group (20-30) for female patients, which amounted to (8.40 \pm 0.14 pg/ml). The infected women likewise had high LH concentrations and low FSH concentrations, which were (14.85 \pm 0.94) and (5.20 \pm 0.607) mIU/ml, respectively. There was no difference in the concentration of LH hormone for female patients in the two age groups (20-30) and (40-31), as it was (15.08 \pm 1.28) (14.21 0.28) mIU/ml respectively., and no difference was shown in the concentration of FSH among the female patients in the age groups (20-30) and (40-31), its concentration was (5.58 \pm 0.90) and (4.11 \pm 0.13) mIU/ml respectively.

Keywords: Toxoplasmosis, FSH, LH, IL-12 and IFN- γ .

Introduction: Toxoplasma gondii is an intracellular obligate protozoa. Toxoplasma parasite completes its life cycle in two hosts, the definitive host represented by cats and the intermediate host represented by humans and other mammals (Mohamed, 2020). Infection with the parasite occurs in three phases, and these phases are: Tachyzoites, Bradyzoites, and Oocysts shed by cats (Lewid and Cabanacan-Salibay, 2012).

The immune system plays an important role in controlling toxoplasmosis infection by means of autoimmune mechanisms and adaptive immune response, as infection with toxoplasmosis stimulates two types of immune response, namely the cellular immune response and the humoral immune response. The initial infection with the parasite stimulates the production of cytokinetic IL-12 (Interleukin 12) and interferon gamma (INF- γ) by cells of the immune system (Cald and De Souza, 2018). Women's infection with Toxoplasmosis leads to a change in the concentrations of some hormones, including follicle stimulating hormone (FSH) and luteinizing hormone (LH) (Al-Asady, 2017).

Materials and working methods:

The current study was carried out between December 8, 2022, and May 24, 2022. Toxoplasmosis-infected pregnant and aborted women provided 60 blood samples, while non-infected women provided 30 blood samples. 5 ml of venous blood was collected and placed in SST (Serum Separating Tube) tubes for 10-15 minutes to separate the serum before centrifuged for 10 minutes at 3500 rpm. An ELISA from Sunlong was used to measure the concentration of IL-12 and IFN- γ cytokines. The Monobin enzyme-linked immunosorbent assay (ELISA) was also used to measure the concentration of FSH and LH.

Results and Discussion:

According to the study's findings, infected women had higher levels of IL-12 and IFN- γ than non-infected women (10.17 0.20 and 8.67 0.18 pg/ml, respectively) (Table 1).

Table (1): IL-12 and IFN- γ level in women with toxoplasmosis under study.

control	infected	groups
Number		characteristics
30	60	
6.79 \pm 0.32 B	10.17 \pm 0.20 A	IL-12 Pg/ml
6.75 \pm 0.20 B	8.67 \pm 0.18 A	IFN- γ Pg/ml

* Different capital letters within the same row indicate significant differences ($p \leq 0.05$) between the stages of pregnancy

This could be because IL-12 plays a key role in initiating a cell-mediated immune response against *Toxoplasma gondii* and helps to protection against *Toxoplasma* parasite infection in both acute and chronic phases. IL-12 plays a key function in the immunological modulation of proinflammatory reactions, and this cytokinesis increases natural killer cell cytotoxicity and induces angiogenesis (Ismael and Salih, 2019). The high concentration of IFN- γ may be due to the fact that the latter is secreted naturally during pregnancy from natural killer cells and trophoblast cells in the endometrium, as IFN- γ works to re-form the blood vessels in the endometrium at the site of implantation, and any defect in the concentration of IFN- γ leads to miscarriage (Murphy et al., 2009).

The results of the study also revealed that there was no change in the concentration of IL-12 within the two age groups (20-30) and (40-31), where it reached (10.15 \pm 0.25) and (10.32 \pm 0.33) pg/ml, respectively, while a high level was recorded). The concentration of IFN- γ within the age group (40-31), which amounted to (9.61 \pm 0.51 pg/ml) compared to its concentration in the age group (20-30), which amounted to (8.40 \pm 0.14 pg/ml) (Table 2).

Table (2): IL-12 and IFN-γ concentrations in affected women within different age groups.

Age group)year(Number	Characteristics	
			IL-12 Pg/ml	IFN-γ Pg/ml
infected	30-20	44	10.15±0.25 A	8.40±0.14 B
	40-31	16	10.32±0.33 A	9.61±0.51 A
uninfected	30-20	17	7.25±0.44 B	6.72±0.25 C
	40-31	13	6.20±0.43 B	6.79±0.32 C

* The different capital letters within the same column indicate that there are significant ($p \leq 0.05$) differences between the age groups.

Perhaps this is due to the fact that the immune system is stimulated when a foreign body enters an organism's body (Weng and Pawelec, 2019 , Abdulwahhab, 2021). Additionally, some research show that the number of natural killer cells rises with ageing (Valiathan, 2016). It is understood that interferon-gamma IFN-γ is secreted by natural killer cells (Al-Dorry et al., 2021). The natural killer cells, one of the cells that encourage the body to fight the Toxoplasma parasite, may be the cause of the elevated interferon-gamma IFN-γ concentration.

Luteinizing Hormone (LH) concentration was found to be higher in female patients (14.85±0.94 mIU/ml), but it was lower in healthy controls (6.39±0.13) mIU/ml. While it was discovered that the levels of the FSH hormone decreased (5.20±0.67 mIU/ml) in the female patients, they were observed to increase (10.86±0.35 mIU/ml) in the healthy individuals (Table 3).

Table 3: Follicle-stimulating hormone (FSH) and luteinizing hormone (LH) levels for women with and without toxoplasmosis.

control	infected	Groups characteristics
number		
30	60	
6.39±0.13 B	14.85±0.94 A	LH mIU/ml
10.86±0.35 A	5.20±0.67 B	mIU/ml FSH

* The different capital letters within the same row indicate that there are significant ($p \leq 0.05$) differences between the groups.

This discrepancy in hormone levels may be caused by feedback, whereby a high amount of LH causes a reduction in the level of follicle stimulating hormone (FSH), and vice versa (Kumar and Sait, 2011). Additionally, as T cell numbers rise, luteinizing hormone (LH) levels rise as well (Jones et al., 2019 , Al-Qadi et al., 2019). T cells, one of the immune system's defence mechanisms against toxoplasmosis, may also be responsible for the elevated amounts of luteinizing hormone (LH) found in toxoplasmosis patients.

According to the study's findings, luteinizing hormone (LH) levels in toxoplasmosis-infected women between the ages of 30 and 31 and 40 and 31 did not differ significantly from each other (15.08 ± 1.28) mIU/ml and (14.21 ± 0.28 mIU/ml) respectively. Follicle-stimulating hormone (FSH) levels in toxoplasmosis-infected women in the age ranges of 30–20 and 40–31 years were (5.58 ± 0.90 mIU/ml) and (4.11 ± 0.13 mIU/ml), respectively, with no discernible variation in concentration. Table 4).

Table (4): FSH and LH concentrations in women with toxoplasmosis in different age groups.

age group (year)		Number	characteristics	
			LH MIU/ml	FSH MIU/ml
Having infection	30-20	44	15.08 ± 1.28 A	5.58 ± 0.90 B
	40-31	16	14.21 ± 0.28 A	4.11 ± 0.13 B
uninfected	30-20	17	6.40 ± 0.17 B	11.14 ± 0.26 A
	40-31	13	6.38 ± 0.22 B	10.49 ± 0.74 A

* Different capital letters within the same row indicate significant differences ($p \leq 0.05$) between the groups

Perhaps the reason for the disparities in study outcomes is that the Toxoplasma infection affects the pituitary gland (Al-Ghezy et al., 2016 , Abdulwahhab, 2022). Because the pituitary gland is responsible for the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), the Toxoplasma parasite's influence on the pituitary gland may be the source of the imbalance in sex hormone secretion. As previously said, the cause could be linked to the hormonal imbalance that happens during pregnancy.

References:

- Abdulwahhab, I. G. (2021).** Effect of *Crataegus Azarolus* Extracted in Treatment of *Giardia Lamblia* Infection. Indian Journal of Forensic Medicine & Toxicology, 15(2).
- Abdulwahhab, I. G. (2022).** Phylogenetic tree of *Blastocystis hominis* in Iraqi children in Salah AL-Deen province, Iraq. Annals of Parasitology, 68(2), 391-398.
- AL-Asady, R.A. (2017).** The levels of testosterone, FSH and LH in Pregnant Women with Chronic Toxoplasmosis in Najaf Province. Al-Qadisiyah Med. J. 13(23): 34-41.

- Al-Dorry, Z.A.; Yaseen, N. and Molan, A.L. (2021).** Immune response in *Toxoplasma gondii* seropositive Iraqi aborted pregnant women in comparison with seronegative women. Am. J. Life Sci. Res. 9(1): 7-1.
- Al-Ghezy, Z.S.; Al-Abady, F.A. and Al-Snafi, A.E. (2016).** Histological effects of Toxoplasmosis and its treatments on male and female rats. American J. Pharm. Health Res. 4(4): 40-52.
- Al-Qadi, R.T.S., Abdulwhhab, I.G., Saeed, I.A.H.M. (2019).** Effect of pregnancy on some biochemical and immunological measures for women with toxoplasma gondii. Biochemical and Cellular Archives, 19(1), pp. 761–765
- Cald, L.A. and De Souza, W. (2018).** A window to *Toxoplasma gondii* egress. Pathogens. 7(3): 1-13.
- Ismael, A. K. and Salih, T.A. (2019).** Studying the role of IFN - γ , vitamin C, SOD, LH, FSH, APA and ACA in *Toxoplasma gondii* infected miscarriage women . Baghdad Sci. J. 16(3): 697-706.
- Jones, B.C.; Hahn, A.C. and DeBruine, L.M. (2019).** Ovulation, sex hormones, and women's mating psychology. Trends Cognit. Sci. 23(1): 51-62.
- Kumar, P. and Sait, S.F. (2011).** Luteinizing hormone and its dilemma in ovulation induction. J. hum. Reprod. Sci. 4(1): 2-7.
- Lewide, S.Y. and Cabanacan-Salibay, C. (2012).** serologic detection of *Toxoplasma gondii* infection in stray and household cats and its hematologic evaluation. Sci. Med. 20(1): 76-82 .
- Mohamed, K. (2020).** Toxoplasmosis in humans and animals in Saudi Arabia: A . Developing Countriesn. J. Infect.14(8): 800-81.
- Murphy, S.P.; Tayade, C.; Askhar, A.A.; Hatta, K.; Zhang, J. and Anne-Croy, B. (2009).** Interferon γ in successful pregnancies . Biol . Reprod. 80: 848-859.
- Valiathan, R.; Ashman, M. and Asthana, D. (2016).** Effects of ageing on the immune system: infants to elderly. Scand. J.immunol, 83(4): 255-266.
- Weng, N.P. and Pawelec, G. (2019).** Research on immunity and ageing comes of age. Immunity & Ageing. 16(1): 1-2.