A STUDY OF THE RELATIONSHIP BETWEEN TOXOPLASMOSIS AND ITS EFFECT ON THE LEVEL OF THE COMPLETE BLOOD COUNT AND THE LEVEL OF INTERLEUKIN 10 AMONG ABORTED WOMEN IN THE CITY OF TIFFRIT

Zainab Kareem Mohammed Al-Taei, Maysoon Mustapha jasim
College of Education for Pure Sciences, Tikrit University, Tikrit/Iraq.
zainab@st.tu.edu.iq

ABSTRACT
This study included 100 women, 75 women with recurrent abortions, one or more abortions, and 25 women without previous abortions and without any infection (control group). Serological test was made by using ELIZA technique to measure some cytokines (interleukin 10). The study showed that the prevalence of infection with Toxoplasma gondii parasite was the highest within the age groups (25-34 years). The current study indicated that the level of IL-10 significantly increased in the sera of infected women, which amounted to 11.0 compared to the control group 5.11. The studies showed that by measuring the number of platelets in the group of women infected with the parasite compared to the control group, the normal percentage of the number of platelets for the control group was 254.3, while the number decreased to 206.5 in the infected women. Blood cell volume (PCV) was significantly decreased for women who were infected with the parasite 30.73 compared to healthy women 39.7. The number of red blood cells in patients was 7.4, while the number in healthy women was 4.170. The number of WBCs increased significantly in infected women 13.87 compared to healthy women 7.62. The study also showed the highest frequency of abortions in women who have had one recurrent abortions compared to those who have had two or three abortions.

I. INTRODUCTION:
Toxoplasmosis arises as a result of infection with the parasite T. Gondii found in the feces of infected cats with Oocysts or eating contaminated meat that is undercooked and containing the infectious phase in the form of tissue cysts, which has a complex and multiple life cycle, where the asexual life cycle occurs in humans and mice. As for the sexual life cycle, it occurs only in cats that are the final host of the parasite, in which the parasite can be transmitted directly from the mother to the fetus, especially during the first trimester of pregnancy, leading to abortions. It can primarily infect the fetus’s central nervous system and this leads to underdevelopment mental illness or death of the aborted fetus (Emilie et al., 2017). Toxoplasma parasite T. gondii is an obligatory zoonotic parasite that has the ability to infect living organisms where the infection may be without clinical symptoms. This parasite also causes a variety of clinical diseases in humans and animals. Therefore, this disease is considered an opportunistic disease for weak immunity (Mahfoz et al., 2019). There is also a close relationship between chronic toxoplasmosis and the age of infected persons (Zhou et al., 2011; Shakir et al., 2020). The percentage of infected persons ranges between 65-30% in humane societies, and the rate of infection varies in countries depending on several factors, including health, social and other factors such as gender, age and other environmental factors. The most common source of infection is the consumption of raw or undercooked meat, as well as poor sanitary conditions (Vas et al., 2011).

Blood is a homogeneous solution consisting of white blood cells, red blood cells and platelets, which flows in a solution of proteins and organic and inorganic ions and has small molecular weights. Blood also contains a light yellowish liquid in clinical cases known as plasma. Plasma fluid is through the sedimentation of the blood in a centrifuge device in conditions where the blood does not coagulate. In the case of blood coagulation, the fluid formed and separated from the coagulated blood is called serum. Serum is defined as the fluid free of fibrinogen (Martin, 1981).
IL-10 is a potent inhibitor of inflammatory and immune responses through its ability to inhibit the production of secreted cellular motors from activated T cells (Kosonen et al., 2006), as this ability of IL-10 is due to the presence of specialized surface receptors that express for IL-10. It is more in many cells, especially in immune cells such as T cells, B cells, and natural killer cells, APC antigen presenting cells, mast cells and granulocytes. Furthermore, its inhibition of the phagocytic activity of monocytes and the production of interferon-gamma IFN-γ and necrosis factor tumor type TNF-α is mediated by IFN-α NKs, but stimulates activated B lymphocytes to produce a large amount of antibodies. Thus, it likely plays a role in amplifying the humoral immune response (Rojas et al., 2017).

Materials and Methods:

100 serum samples were collected for complete blood count tests and IL-10. The principle of the test is on the interaction between the immune antibodies present in the patient’s serum with antigens. ELIZA technique was used to measure the level of IL-10. It was found that 75 samples were infected with the Toxoplasma disease and 25 non-infected control samples, ages ranged between 19-45 years.

Statistical Analysis

The results were statistically analyzed according to the analysis of variance (ANOVA), the (F test) and the (T test) by using the statistical program (minitab), and the arithmetic means were compared to determine the significant differences between them using the (drabken) multinomial test with the probability level of 0.05 and 0.01.

Results:

A study conducted upon 75 samples of aborted women infected with Toxoplasmosis in the city of Tikrit. The results of the current study show in Table (1) that patients with age group 25-34 severely injured or infected compared to another group where they reported 42.7% and age group between 19-24 reported 32.0%, age group between 35-45 reported 25.3% of infection based on a P-value of 0.627.

Table (1): Number and percentage of infection, distributed by age groups

<table>
<thead>
<tr>
<th>Age group (Years)</th>
<th>Patient</th>
<th>%</th>
<th>control</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 – 19</td>
<td>24</td>
<td>32.0</td>
<td>9</td>
<td>36.0</td>
</tr>
<tr>
<td>25 – 34</td>
<td>32</td>
<td>42.7</td>
<td>8</td>
<td>32.0</td>
</tr>
<tr>
<td>35-45</td>
<td>19</td>
<td>25.3</td>
<td>8</td>
<td>32.0</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

Ns
Chi-Square = 0.933 P-Value = 0.627

The current study indicated that the level of IL-10 was significantly increased in the sera of infected women, which amounted to 11.0 compared to the control group 5.11. IL-10 regulates the synthesis of both IL-12 and IFN-γ (important in controlling rapid doubling during the period of time). The acute and chronic phases of infection help avoiding an excessive immune response that may lead to severe inflammatory conditions and damage to the host tissues.

Table (2) shows the relationship of kinetics (immune interleukin) IL-10 between study totals.

<table>
<thead>
<tr>
<th>Cytokines</th>
<th>Positive</th>
<th>Negative</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL-10</td>
<td>10.9 ± 1.7 ml/pg</td>
<td>5.11 ± 0.23 ml/pg</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

P≤0.01**

The studies showed that by measuring the number of platelets in the group of women infected with the parasite compared to the control, the normal percentage of the number of platelets for the control group was 254.3, while the number decreased to 206.5 in the infected women, Table (3). The pressurized blood cell volume (PCV)
significantly decreased for women infected with the parasite 30.73 compared to healthy women 39.76. Red blood cells are the main component in the blood, and this component is the first affected factor in case of infection. It is noted in Table (3) a significant increase in this main component in infected women, as the number of red blood cells in patients was 7.4, while the number in healthy women was 4.170. White blood cells are one of the defense mechanisms in the host's body, and increasing their numbers in the event of any disease means confronting the causes of autoimmune diseases in the human body. Therefore, the results shown in Table (3) are indicative. The number of WBCs increased significantly in women infected 13.87 compared to healthy women 7.62. It was also found that the concentration of hemoglobin decreased in the group of patients, which amounted to 13.020 compared to the control group 10.27.

Table (3) Results of blood parameters for groups under study.

<table>
<thead>
<tr>
<th>Blood parameters</th>
<th>Patients</th>
<th>Control group</th>
<th>P=Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC</td>
<td>8.6±1.3</td>
<td>4.170±0.459</td>
<td>0.460</td>
</tr>
<tr>
<td>Hb</td>
<td>10.27±1.14</td>
<td>13.020±0.938</td>
<td>0.0005</td>
</tr>
<tr>
<td>PCV</td>
<td>30.73±3.73</td>
<td>39.76±3.87</td>
<td>0.0005</td>
</tr>
<tr>
<td>WBC</td>
<td>13.87±2.86</td>
<td>7.62±0.99</td>
<td>0.0006</td>
</tr>
<tr>
<td>MONO</td>
<td>10.95±1.87</td>
<td>4.99±0.24</td>
<td>0.0006</td>
</tr>
<tr>
<td>LYMPH</td>
<td>42.51±4.34</td>
<td>31.06±4.85</td>
<td>0.0005</td>
</tr>
<tr>
<td>PLT</td>
<td>206.5±49.3</td>
<td>254.3±10.6</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

P L T 150-450: mL 10^3
LYMPHO% 20.0-40.0:
MONO% 2.0-10.0:
W B C 4.0-11.0: mL 10^3/
P C V % 35.0-50.0:
H b 12.0-16.0: g/dL
R B C 3.50-5.00: mL 10^6/

II. DISCUSSION

Toxoplasmosis is known to cause an infection in the uterus often responsible for abortion, stillbirth, preterm delivery and congenital malformations. Detection and treatment of such infections can prevent morbidity and mortality in children born by such mothers (Ahmad & Kareem, 2020). Elevated IL-10 levels in chronic infections may play a role in down-regulation of the inflammatory response by lowering the cyst burden that serves the host (Al-Khozai et al., 2006; Khabir et al., 2005). This result was identical to what was reached by Mahmoud 2016, Jannah 2006, Al-Ajil 2012, and Flynn et al., 2011, Suvas et al., 2004, and Kohler et al., 2017). It also plays a major role in eliminating intracellular microbes during infection. Moreover, it is important in passive immune modulation during the chronic phase of inflammation, which is important in reducing the severity of tissue injury and dysfunction of the organs (Yoshida, 2015). It acts as an anti-inflammatory, which has an inhibitory role and acts as an anti-inflammatory in the immune response of Th1, Th2 and Th17 (Belle et al., 2016).
The studies showed that by measuring the number of platelets in the group of women infected with the parasite compared to the control, the normal percentage of the number of platelets for the control group was 254.3, while the number decreased to 206.5 in the infected women as shown in Table (3), which represents low platelet count, high liver enzymes, elevated liver enzyme and hemolysis (Sibai, 2004). These results agreed with Cavkaytar and his group (2007), where it is noted that there is an increase in the conversion of platelet calcium to arginine, and this leads to a decrease in the number of platelets.

The results showed from table (3) that there was a significant increase in the number of lymphoid cells in women infected with the parasite, as the percentage of cells reached 42.36 compared to the control group 31.06. Directly, it is stimulated by a protein 30 derived from the same parasite, where this protein works to stimulate lymphocytes to produce the cellular motors INF-γ - and IL-2 (Montoya et al., 1996). The research indicated the role of lymphocytes in determining infection and in protecting against Toxoplasma gondii (Denkers and Gazzinelli 1998) in addition to the ability of lymphocytes to produce the cytosolic motors INF-γ and IL-17A, which play an effective role in protection against endocytic pathogens (Mcaleer et al., 2010).

The pressurized blood cell volume (PCV) significantly decreased for women infected with the parasite 30.73 compared to healthy women 39.76. This decrease in this component of female patients may be due to a decrease in the number of red blood cells, as the percentage of PCV compressed blood cells depends on the number of red blood cells. The percentage of compressed blood volume (PCV) and the increase in the breakdown of red blood cells or the decrease in their formation are the result of iron deficiency and a decrease in the number of red blood cells. This leads to a decrease in the volume of pressurized blood cells. Infection with the parasite causes hemolytic anemia (Kaushansky et al., 2010).

Red blood cells are the main component of blood, and this component is the first affected factor in case of disease. A significant increase shown in this main component in women infected, as the number of red blood cells in patients was 7.4, while the number in healthy women was 4.170. The reason for the increase in the number of red blood cells may be due to inflammatory processes in the body and hormonal disorders. It affects the process of formation of red blood cells by its effect on the hormone erythropoietin, which in turn stimulates the bone marrow on the process of forming red blood cells Erythropoiesis. Thus, increasing the efficiency or absorption of oxygen (Al-Mobarak, 2006) and the high numbers of red blood cells may return as a result of an increase in the concentration of the erythropoietin hormone. It should be noted that the study by (Fisher, 2003) which showed that free radicals can interact with DNA, leading to a mutation or causing a toxic effect to the cell, may be linked to the membrane of the red blood ornament, which is rich in unsaturated fatty acids in addition to destroying or causing damage to the red blood cell membrane.

White blood cells are one of the defense mechanisms in the host's body, and increasing their numbers in the event of any disease means confronting the causes of autoimmune diseases in the human body. Therefore, the results shown in table (3) indicate a significant increase in the number of WBCs in infected women 13.87 compared to healthy women 7.62. In resisting bacterial, viral and parasitic infections whose numbers increase or decrease as a result of this infection (Ajioke et al., 2002) and also may increase their numbers as a result of an increase in the number of monocytes and monocytes and this increase may be the result of infection with Toxoplasma gondii parasite and this in turn stimulates the immune system of the host represented Humoral immunity. The results of the current study did not agree with the study by Al-Obaidi (2011) and Al-Mousawi (2014)) because the total number of white cells remained within the normal range for infected and uninfected women, but it agreed with the Al-Quraishi’s study (2009) which recorded an increase in the number of white blood cells as a result of infection with parasites as well as infection with Toxoplasma gondii causes a significant increase in the number of white blood cells lymphocytes and B cells. Therefore, a total increase shown in white blood cells (Kaushansky et al., 2010), while in mononuclear cells, a significant increase was observed in the 10.95 patients group compared to the control group 4.99. This study agreed with both Al Dulaimi’s (2002) and Ageel’s (2003) studies.

It was also found that the concentration of hemoglobin in the group of patients was 13,020 compared to the control group 14,979. These blood changes for women infected with the parasite are not a cause of anemia, but the anemia or the bleeding that occurs to women as a result of abortion caused by infection leads to anemia, as the analysis of red blood cells in the infected tissue cause a decrease in the level of Hb (Byrne et al., 1986). These results agreed with Al-Alayan and Al-Safi 2018, Abdel-Rashid 2012, Mahmoud 2016 and Abdel-Abbas 2015.
The results of the current study showed at the 0.01 probability level that there were significant differences between parasite infection and the number of abortions < table (4). The highest percentage was 46.7% when the number of abortions was 1, and the lowest percentage was 21.3% when the number of abortions was 3. The reason for the emergence of the highest infection rate among women who suffer from a one-time abortion to the rupture of the cyst located in the wall of the uterus due to the expansion that occurs during pregnancy, leading to the release of the parasite and infection of the fetus. Also, the mother’s suppression of immunity during pregnancy causes reactivation of chronic infection and release of the parasite from the cyst and penetration into the tissues of the placenta and infection of the fetus, which leads to abortion. The rise in the rate of single abortion may be due to the ignorance of most women of their infection with *Toxoplasma gondii* before marriage, and that their pregnancy and the accompanying problems at its inception necessitated conducting various diagnostic tests to determine the causes of this pregnancy threatened with abortion, which confirmed that she had Toxoplasma infection and required rapid treatment periodic. This result is consistent with the findings of both researchers (Agrawal et al, 2016; Ahmed, 2017; Mahmood & Shareef, 2019).

Table (4): Number and percentage of infection, distributed according to the number of abortions

<table>
<thead>
<tr>
<th>The number of miscarriages</th>
<th>Infected</th>
<th>%</th>
<th>Not infected</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>22</td>
<td>88.0</td>
</tr>
<tr>
<td>1</td>
<td>35</td>
<td>46.7</td>
<td>2</td>
<td>8.0</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>32.0</td>
<td>1</td>
<td>4.0</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>21.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>**Total</td>
<td>75</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

**Chi-Square = 84.790  P-Value = 0.00002

REFERENCES:


