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Toxoplasmosis disease and its association with hepatic enzymes

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Abstract:-

In this study, 120 women with history of abortion were subject to serological tests (ELISA test) to trace cases of Toxoplasmosis. The IgG &IgM antibodies were increase ($p<0.05$) in the sera of women with toxoplasmosis in the percent 17.5% for IgG, 3.3% for IgM and 1.6% for IgG&IgM antibodies. The highest rate of positivity was recorded in women who suffered from abortion with age of (26-35) age group 56.3%, while the lest rate of seropositivity was recorded in women with age of (36-45) age group was 16.4%. The levels of liver enzymatic including Aminotransferases (ALT & AST) and Alkaline Phosphates (ALP) were measured in the toxoplasmosis seropositive women and compared to their respective mean values in the sera of seronegative women, the mean levels of ALT & AST and ALP were significant elevation $p<0.05$ in the seropositive women in comparison to the seronegative women. Moreover, there were no significant elevations in the levels of the studies biochemical parameters within the age groups of toxoplasmosis seropositive women and seronegative women. In conclusion, the concomitant rise of the serum enzymes activities and the associated changes in the levels of IgG & IgM antibodies. This process might be incriminated for the host tissue infestation by this parasite which has the ability to survive in the host cells and tissues for life and that may gives to the repeated abortions.

Introduction:-

Toxoplasmosis is one the most common diseases of animals and humans. It is caused by the obligate intracellular coccidian parasite Toxoplasma gondii .The definitive host of this parasite is the cat and other felines. Host cell invasion by Toxoplasma plays a crucial role in the pathogesis of infection [1].

Toxoplasma gondii is capable of infecting all warm blooded animals. However, the parasite enters all cells types by both phagocytosis and active invasion, then it cross the placenta to the fetus during pregnancy causing congenital toxoplasmosis [2]. The infection is generally of symptomatic or unrecognized. Therefore, the host remains infected for life [3].

IgG antibody reaches a maximum concentrations two months post infection, this will persist for life. IgM appears before IgG, and disappears before the latter reaches its peak. Whilst these events clear the tachyzoites from the blood [4].Chronic toxoplasmosis as a cause but not a frequent cause abortion, a fact that was stressed by

Key words: Toxoplasmosis, Hepatic enzymes, ALT, AST, ALP.

several other investigations [3, 5].

Many research works have been done on different clinical forms of the disease, but very little informations are available about the biochemical changes associated with this disease. It was concluded that parasitic disease could be considered as an important cause of liver enlargement with an increase in enzyme activities [6]. Many investigators were observed an elevation in the levels of liver enzymes Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST) and Alkaline Phosphates (ALP) in the serum of patients with toxoplasmosis [7-9]. Levels of these enzymes in blood reflect the occurrence of liver damage or muscle damage [9].

In Iraq, the infection with toxoplasmosis among recorded by Najim and AL-Saffer (1968) who showed that the positively was 40.5 % [10]. While AL-Dujaily (1998) obtained a decreased an infection rate to 34.7% among aborted women in Baghdad [11].

Material and Methods:-

The study group is comprised of (120) women (their age range is 16-45 years) with history of abortion. All patients were examined in AL-Zahra Hospital in Baghdad from Dec. 2009 to May 2010 to exclude toxoplasmosis .None of the tested women were suffering from chronic illness (diabetic mellitus, hypertension, and rheumatic disorders….est.) or resent acute infection or tissue injury. Five milliliters of venous blood were collected and allowed to clot at room temperature. The sera were separated by centrifugation at 3000 rpm for 5 min. Each serum sample stored at -20°c for serological and biochemical tests. Serological test was determined by Enzyme Linked Immunosorbent Assay (ELISA) method [12]. Biochemical tests were carried out to Aminotransferases (ALT and AST) activities according to the recommended method of Reitman and Frenkel (1957) [13], and for ALP activity was determined by King-Armstrong method [14].

Results and Discussion:-

Our results in table- 1 shows that the seropositivity rate of toxoplasmosis among (120) women with history of abortion, was 45.8% (55 cases) using ELISA test. However, in comparison to some previous studies among the women who suffered from abortion, we observed that the overall prevalence rate in this study was higher than those recorded by AL-Dujaily(1998) who achieved an overall three serological tests (IFAT, dye test and direct agglutination test) [11].

Table- 1: The seropositivity rate of toxoplasmosis among women with abortion by using ELISA test:

Clinical groups	ELISA test

	No.	(%)
Seropositive	55	(45.8%)
Seronegative	65	(54.2%)
Total	120	(100%)

The ELISA test results of (IgG, IgM) Abs shows that there was a significant increase in IgG, IgM in Seropositive women group as compared to their Seronegative group in an elevation ($P<0.05$), as shown in table-2 and table-3 :

Table- 2: The IgG level in Seropositive and Seronegative groups:

Clinical groups	No.	IgG level (IU/ml) (M±SD)	Upper value	Lower value
Seropositive	55	$78.579 \pm 67.268^{*}$	190.093	32.107
Seronegative	65	$8.172 \pm 12.610^{*}$	20.172	1.064

t-test: seropositive vs. seronegative: (* $p<0.05$) .

Table- 3: The IgM level in Seropositive and Seronegative groups:

Clinical groups	No.	IgM level (IU/ml) (M±SD)	Upper value	Lower value
Seropositive	55	$0.571 \pm 0.478^{*}$	1.758	0.689
Seronegative	65	$0.276 \pm 0.185^{*}$	0.199	0.110

t-test: seropositive vs. seronegative: (* $p<0.05$).

The results were in agreement with Akin et al.(1990) and Malk et al.(1995) [15,16].

Table- 4 shows that the women carrying the IgM is 3.3% (9 cases), 17.5% (50 cases) carrying the IgG Ab and 1.6% in 4 cases carrying the (IgG, IgM) Abs ;

Table- 4: The IgG, IgM percentage in seropositive women:

Immunoglobulin type	Seropositive Women (%)
IgG	17.5%
IgM	3.3%
IgG, IgM	1.6%

These results shows a difference with Dhumne et al.(2007) research, explained that the women carrying the IgG was 24.3%, those carrying the IgM was 2% and that carrying the two of toxoplasma was 1.5[17]. But Alvarado *et al.* (2009) research shows that 8.2% of women carrying IgG, and 2.3% carrying IgM [18].

Table – 5 shows the distribution of the seropositivity for toxoplasmosis according to the age group. The most affected women were those with maternal age of 26-35 years, following by those with age of 16-25 years. These results indicate that the seropositivity increases with the maternal age, till the age of 36 years, then the rate of

positivity started to decline in the age group 36-45 years. This observation may be attributed to the high fertility rate at those age groups who were risk of explore to the offering factors for the disease. These finding were in agreement with those recorded by many researchers AL-Dujaily *et al.*(1998), Jasim *et al.*(1979) and AL-Katib *et al.*(1994) [11,19,20]. More over, our results have conferment the concept previously reported by Jones et al.(1969) that toxoplasmosis increase with the maternal age as the number of pregnancies would tend to increase with the age[5].

Table- 5: Distribution of the seropositivity to toxoplasmosis according to the maternal age of women with history of abortion using ELISA test:

Age groups(years)	Seropositivity Rate / ELISA test	
	No.	(%)
16-25	15	(27.3%)
26-35	31	(56.3%)
36-45	9	(16.4%)
Total	55	(100%)

Measurements of enzyme activity in blood constitute some of the most sensitive indices of tissue damage [21]. In this study, the mean (± SEM) activities of the serum enzymes (ALT, AST and ALP) in both seronegative and seropositive women were listed in (Table - 6). In the seropositive women, the mean activity of serum AST (23.40 ± 8.82 IU/L) were showed statistically significant increase ($P<0.05$) as compared to their respective mean enzyme activity in the seronegative group AST (8.60 ± 2.80 IU/L). Moreover, a significant elevation ($P<0.01$) was also reported in the mean serum ALT activity (24.32 ± 6.90 IU/L) and ALP (112.83 ± 50.89 IU/L) was compared to their counter part mean values of seronegative women (ALT = 3.88 ± 1.08 IU/L and ALP (33.23 ± 10.12 IU/L in an order).

Table – 6: The (Mean± SD) values of serum ALT, AST and ALP enzyme activities in Seronegative and Seropositive Women:

	(M ± SD) Enzyme activities (IU/L)	
	Seronegative (n= 35)	Seropositive (n= 25)
ALT	3.88 ± 1.08	24.32 ± 6.90**
AST	8.60 ± 2.80	23.40 ± 8.82*
ALP	33.23 ± 10.12	112.83 ± 50.89**

t-test: Seropositives vs Seronegatives (* $p<0.05$, ** $p<0.01$)

We observed that the obtained increase in the mean serum enzymes (ALT, AST and ALP) of seropositive women, were in the normal levels of these enzymes. In previous work, AL-Dujaily et al. (1998) recorded higher values of serum ALT (17-29 IU/L), and AST (22-38 IU/L) associated with acute toxoplasmosis in aborted women. However,

the involvement of the liver as a late complication during infection with Toxoplasma gondii has been noted in various clinical forms of toxoplasmosis. Yet, many scientists observed abnormal increase in the hepatocellular enzymes in congenital toxoplasmosis [22-25], and in acute required toxoplasmosis [7, 26]. In 19983, Sacks showed that serum AST in patients with acute toxoplasmosis [8]. Moreover, Ortego et al (1990) reported arise in the levels of serum ALT, AST and ALP in patients with toxoplasmic chorioretinitis [9]. Yamada et al. (1989) described a case of developed acute polymyositis and chorioretinitis due to toxoplasma infection [27].The rise in levels of enzymes in blood may be due to the damage of tissues [28]. In general, the increase in ALT, AST and ALP activities in blood are used usually for the detection of hepatocellular damage and muscle damage [21]. When ever liver cells are damaged or injured, the liver enzymes are leaked out into the circulation across the damaged cell membranes [29]. In the early hepatocellular disease, the increase in ALT activity are usually greater than those in AST levels which tends to be released to greater extent than ALT in chronic hepatocellular disease[21].

Table -7 shows the effect of maternal age on serum enzyme activities in seropositive and seronegative women. Within groups ANOVA revealed no significant differences in the serum enzyme activities in the all groups studied of both seronegative and seropositive women.

Table -7: The effect of maternal age on serum enzyme activities in seronegative and seropositive women:

	Age group (years)	(M ± SD) Enzyme activities (IU/L)	
		Seronegative	Seropositive
ALT	16 – 25	3.93 ± 1.42	25.41 ±10.15*
	26 – 35	4.33 ± 1.95	24.12 ± 11.42
	36 - 45	3.88 ± 1.51	24.65 ±10.58*
AST	16 – 25	7.33 ± 3,12	22.71 ± 9.73*
	26 – 35	8.54 ± 3.82	23.15 ± 10.26
	36 - 45	8.42 ± 3.71	23.62 ± 9.82
ALP	16 – 25	31.23 ± 13.23	113.36 ± 54.32*
	26 – 35	32.83 ± 12.51	110.14 ± 52.43
	36 - 45	31.52 ± 13.82	112.25 ± 53.83

t-test: Seronegative vs. Seropositive (* $p<0.05$).

These results was in agreement with AL-Saheen et al.(1999), were reported that there was no significant difference in the values of serum ALT, AST and ALP among the age group of the control and the patients[30].

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الخلاصة :-

في هذه الدراسة خضعت (120) من النساء المجهضات الى أختبارات مصلية (بواسطة أختبار الادمصاص المناعي المرتبط بالانزيم ELISA) لغرض تتبع حالات الأصابة بداء القطط ، تم قياس مستوى المستضدين IgG و IgM ولوحظ بأنه أزداد ($p<0.05$) أمصال النساء المصابات بداء القطط بنسبة 17.5 % بالمستضد IgG و 3.3 % بالمستضد IgM و1.6 % بكلا المستضدين IgG وIgM . ولوحظ بانه أعلى نسبة من النساء المصابات عند الفئة العمرية (26-35) سنة بنسبة 56.3 % بينما النسبة الاقل سجلت عند الفئة العمرية (36-45) سنة بنسبة 16.4 %. كما تم قياس مستويات أنزيمات الكبد التي تتضمن كلا من أنزيم الألنين أمينوترانسفيريز (ALT) ، أسبارتيت أمينوترانسفيريز (AST) و الكالاين فوسفوتيز (ALP) في النساء ذوات الأمصال الموجبة ومن ثم مقارنتها مع مستوياتها في النساء ذوات الأمصال السالبة وظهر انه هنالك أرتفاع معنوي في مستويات الأنزيمات ($p<0.05$) ، علاوة على ذلك وجدنا أنه لا يوجد تغير معنوي في مستويات الأنزيمات تحت الدراسة مع مجاميع الفئة العمرية في أمصال النساء المصابات بداء القطط وأمصال النساء الأصحاء. وبينت هذه الدراسة أن الأرتفاع المتلازم في مستوى الفعاليات الأنزيمية وما رافقها من تغيرات في مستويات IgGو IgM هذه العملية ربما تكون بسبب أصابة أنسجة المضيف بالطفيلي Toxoplasma gondii الذي له القابلية على البقاء حيا" داخل خلايا وأنسجة المضيف مدى الحياة الأمر الذي يتسبب في حالات الأسقاط المتكرر.