

A study of some Sero-epidemiological aspect on *Toxoplasma gondii* in Al-Qadisiya province/ Iraq

Ziad M. Al-Khozai
College of science
Al-Qadisiya University

Baleegh A. Khadem
College of science
Al-Qadisiya University

Abstract:-

This study was confirmed that *Toxoplasma gondii* infections are endemic in Iraq, and toxoplasmosis represent a serious problem in Al-Qadisiya province, so the study was carried out in the period between January 2011 and July 2011, in an attempt to investigate some epidemiological and immunological aspects in patient of Al-Diwania city infected with *Toxoplasma gondii* compared to healthy control group.

About 332 blood samples were collected from women with age range from 1-50 years old who attend to maternity and pediatrics hospital in Diwanya, Al-Shamia hospital, Al-Hamza hospital, Afak hospital and some particular laboratories in this province. The samples of patients were 290 women, while the samples of control group 42.

Epidemiological study showed that the prevalence and incidence of *Toxoplasma gondii* was 63% by using LAT. and 60% by using ELISA-IgG, while by using ELISA-IgM was 34%. The prevalence was increased with age especially between 20-30 years old (68.2%) and between 30-40 years old (68%) by using LAT., 20-30 years old (65%) by using ELISA-IgG, 10-20 years old (61.9%) by using ELISA-IgM. Geographical distribution of sero-markers was noticed in all parts of the province especially in the center of the province Al-Diwanya city and Al-Hamza area. In Al-Diwanya the prevalence of infection with toxoplasmosis appeared 47% and 20% in Al-Hamza area by using LAT, while by using ELISA-IgG was 48% in Al-Diwanya and 20% in Al-Hamza, and 38% in Al-Diwania , 23% in Al-Hamza area by using ELISA-IgM.

Introduction:-

Toxoplasma gondii is an obligate intracellular protozoan parasite, which occurs globally among both humans and animals causes toxoplasmosis (1). This infection may occur vertically by tachyzoites that are passed to the fetus via the placenta, or horizontal transmission which may involve three life-cycle stages i.e. ingesting sporulated Oocysts from cats or ingesting tissue cysts in raw or under cooked meat or tachyzoites in blood products or primary offal (viscera) of many different animals, tissue transplants and unpasteurized milk (2). About one- third of the world population is infected with *T. gondii* and the disease has asymptomatic progress in 90% of the patients with sound immune systems (3). Toxoplasmosis can cause serious pathological lesions including abortion, hepatitis, pneumonia, blindness, and sever neurological disorders These types of diseases are seen particularly in people with weak immune systems (4). After the acute stage, the parasite forms cysts(latent stage) in a variety of organs, particularly the brain, heart, and skeletal muscle, thereby establishing a chronic infection (5). The prevalence of *T. gondii* has been reported to increase with age (>40 years) and in women consuming raw meat, vegetables, and fruit(6). This

study was aimed to focus on some epidemiological and immunological aspects of toxoplasmosis in women of Al-Qadisiya province.

Materials and Methods:-

1- Patients

The study involved 290 women infected with *T. gondii* aged 10-50 years proven to have a chronic & acute infection (IgG positive & IgM positive). The control group consisted of 42 healthy women aged 18-45 years (IgG and IgM negative).

2- Serological Tests

Detection of specific *Toxoplasma gondii* IgG & IgM: Toxoplasmosis Latex test PLASMATEC / UK., Specific *T. gondii* IgG & IgM were evaluated according to the manufacturer instructions of Biochek, CA, USA ELISA Kit.

3- Statistical Analysis

Statistical analysis: Data were expressed as mean \pm S.D. The *t*-Student test was used for comparisons between the patients and control groups. The differences were considered statistically significant when the value of test function was at the level of significance set at $P < 0.05$. All procedures were done using SPSS software, version 11 for windows(16).

Results

Epidemiological Study

Epidemiological study included the pattern of the distribution and the occurrence of diseases using two parameters these are ; Prevalence and the Incidence (17).

1. Prevalence of infection: It is represented by the total number of the infection cases, both new and already existing, in a given area or population during a given period of time, and calculated by the following formula:

Prevalence (P)= No. of total (old and new) recorded cases / No. of people at risk

2. Incidence of infection: It is defined as the number of the new cases of a disease in a given area or population in a given period of time, calculated by the following formula:

Incidence (I)= No. of new recorded cases/ No. of people at risk .

A total of 290 blood serum samples of patient women were seropositive for anti- *Toxoplasma* antibody 184 (63%) by using latex agglutination test (fig. 1); 174 (60%) were positive for anti- *Toxoplasma* antibody by using ELISA-IgG (fig. 2) and 96 (34%) were positive for anti- *Toxoplasma* antibody by using ELISA-IgM (fig. 3).

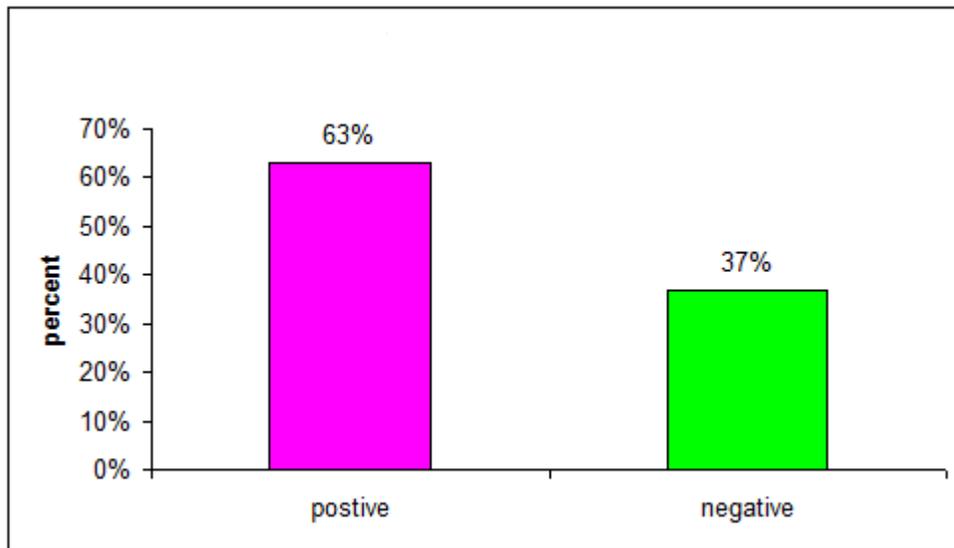


Figure- 1: The percentage of infection by using Latex test

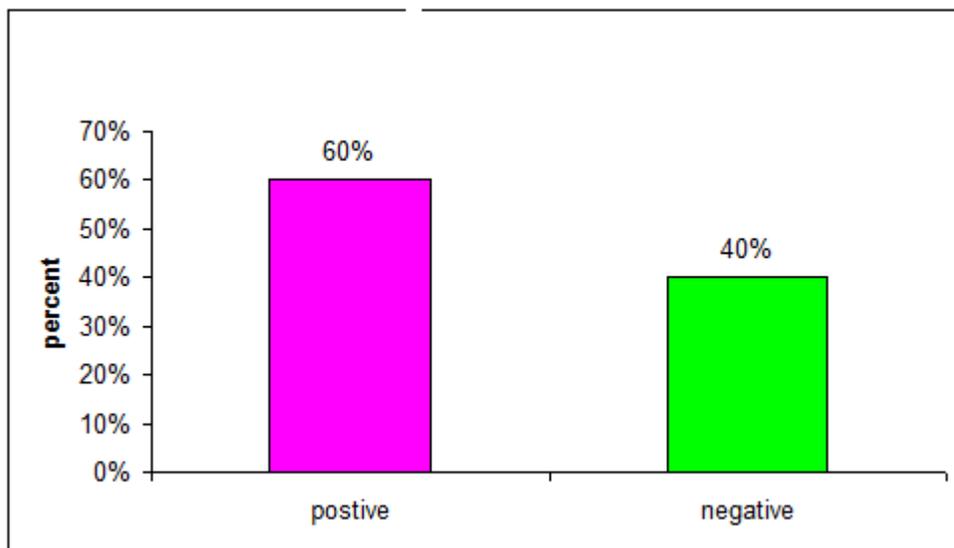


Fig. 2 : The percentage of infection by using ELISA-IgG

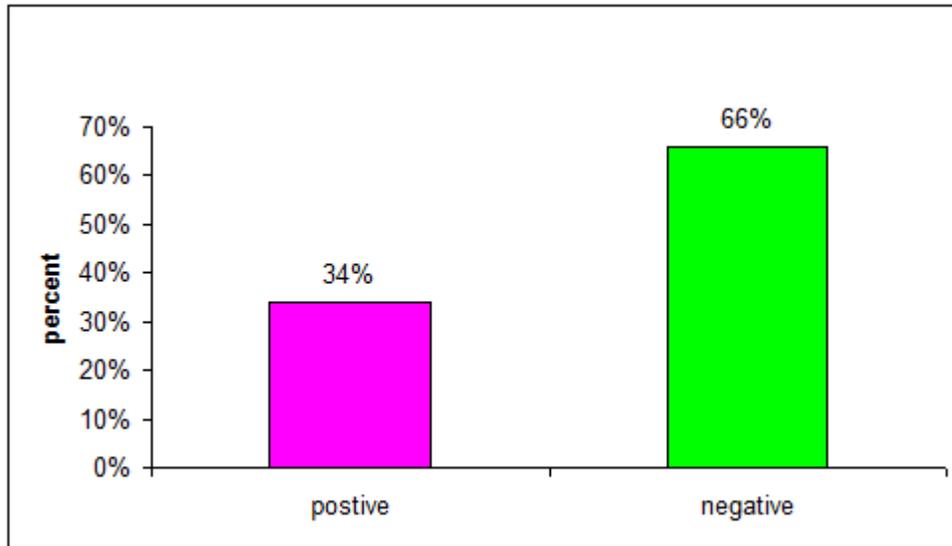


Figure- 3: The percentage of infection by using ELISA-IgM

The overall prevalence of the infection with *T. gondii* by using ELISA was calculated as $P = (270 / 1158000) * 100 = 0.023316062$

Whereas the incidence of the *T. gondii* infection was

$$I = (96 / 1158000) * 100 = 0.008290155$$

Total number of population at risk was 1158000, the total number of *T. gondii* patients was 270, and the number of new document cases was 96 during the study period .

Results clarified that higher percentage of infection was in the age group 20-30 years (68.2%) by using Latex test (fig. 4) ; 20-30 years (65.5%) by using ELISA-IgG (fig.5) and in the age group of 10-20 years (61.9%) by using ELISA-IgM fig. (3.6) .

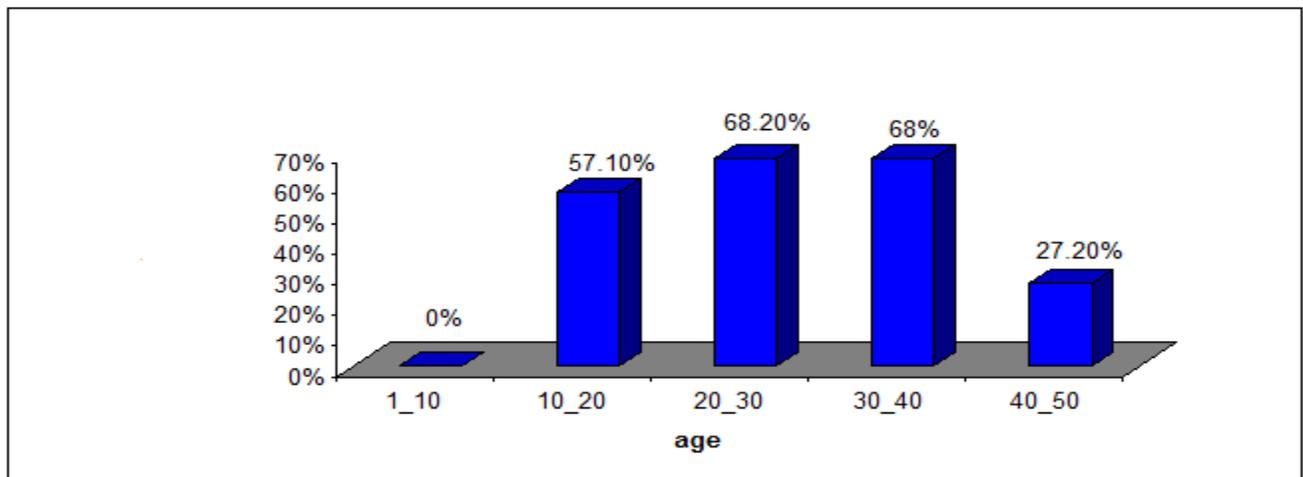


Figure -4: The titer of anti- *Toxoplasma* antibodies by Latex agglutination test according to age groups

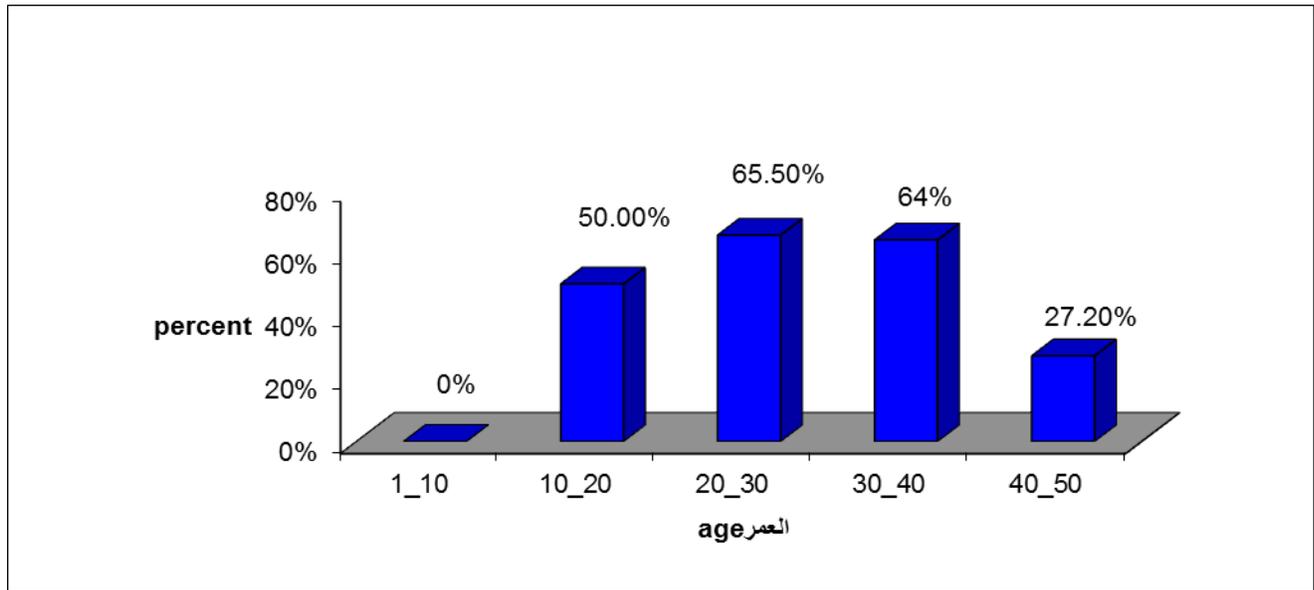


Figure -5: The titer of anti-*Toxoplasma* antibodies by ELISA- IgG according to age groups

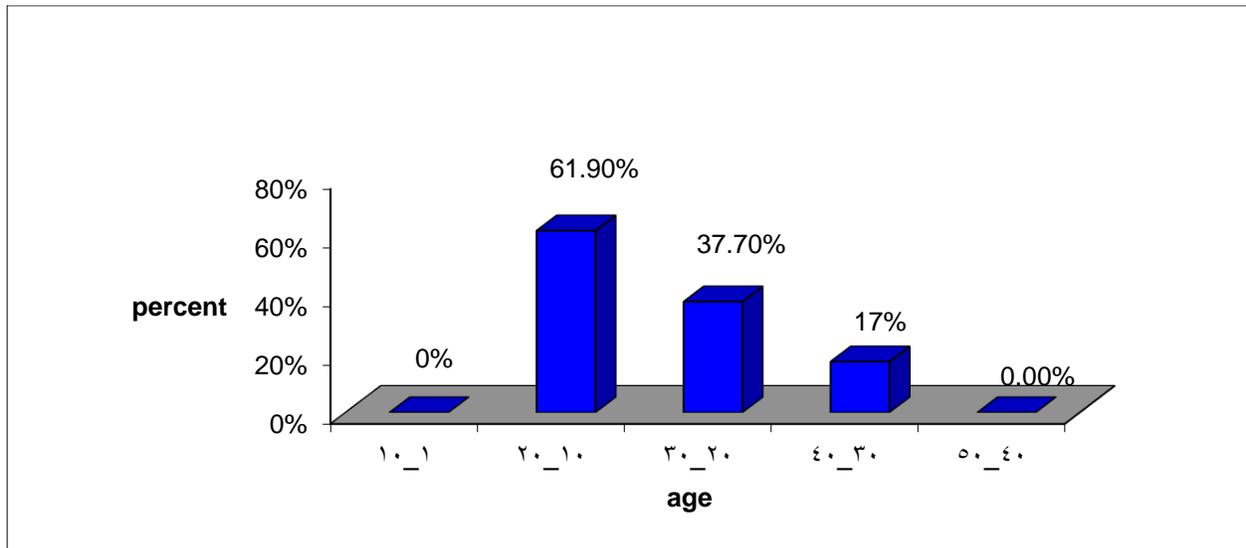


Figure- 6: The titer of anti-*Toxoplasma* antibodies by ELISA- IgM according to age groups

Geographical study :

This study included the determination of the distribution mechanism of the infection with *T. gondii* in the governorate and in the center of the city by using the patients group.

The bulk of the infection were recognized aggregated in two main areas in the province, the first was in the center of the province (Al-Diwanyia city 47%) and in Al-Hamza area (20%) by using LAT. test, while the chronic infection were also recognized aggregated in the center of Al-Diwanyia city province (48%) and in Al-Hamza area (20%) by using ELISA-IgG. As well the acute

infection were recognized aggregated in the center of Al-Diwanyia city province (38.54%) and Al-Hamza area (22.92%) by using ELISA-IgM (table. 1).

Table-1: Geographical distribution of patients with toxoplasmosis in Al-Qadisiya province

Local area	ELISA-IgM		ELISA-IgG		Latex	
	%	NO. of postive samples	%	NO. of postive samples	%	NO. of postive samples
Al-Diwanyia	38.54 %	37	%48	84	%47	87
Al-Hamza	22.92 %	22	%20	34	%20	36
Al-Shamiyia	20.83 %	20	%17	30	%18	33
Afak	17.71 %	17	%15	26	%15	28

Immunological Study

Serum levels of IgG in patients women with Toxoplasmosis infections

IgG levels were assayed by ELISA method in the sera of the patients women with toxoplasmosis infections and compared to the healthy control group. Result showed a statistically significant elevation in the concentration of the IgG in the sera of infected patients women in comparison to those of healthy control group. The concentrations of IgG were significantly elevated ($P < 0.01$) the levels were (mean \pm SD) 776.578 ± 93.21 IU /ml in comparison to healthy control group 13.892 ± 1.65 (fig.10).

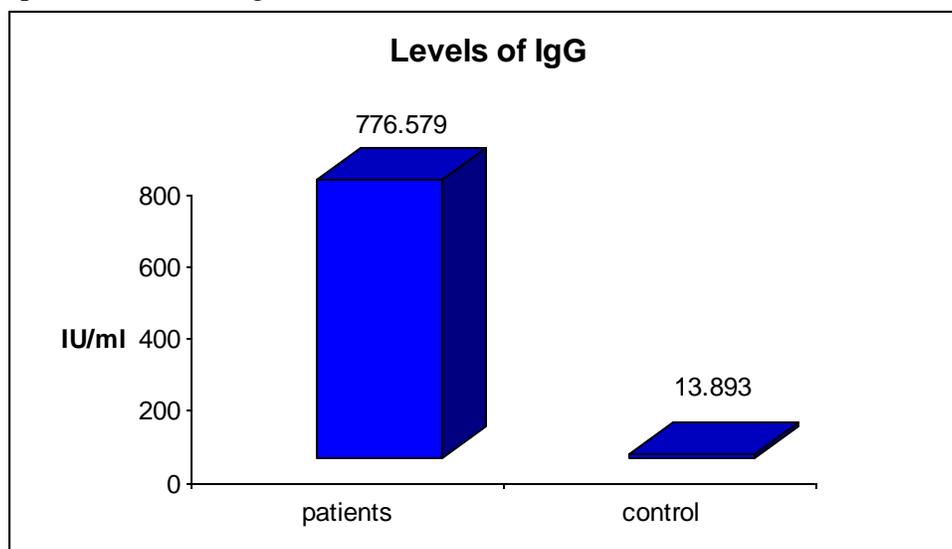


Figure-10: Serum levels of IgG in patients with Toxoplasmosis

Serum levels of IgM in patients women with Toxoplasmosis infections

IgM levels were assayed by ELISA method in the sera of the patients women with toxoplasmosis infections and compared to the healthy control group. Result showed a statistically significant elevation in the concentration of the IgM in the sera of infected patients women in comparison to those of healthy control group. The concentrations of IgM were significantly elevated ($P < 0.01$) the levels were (mean \pm SD) 0.385 ± 0.0023 IU./ml in comparison to healthy control group 0.171 ± 0.027 (fig. 11).

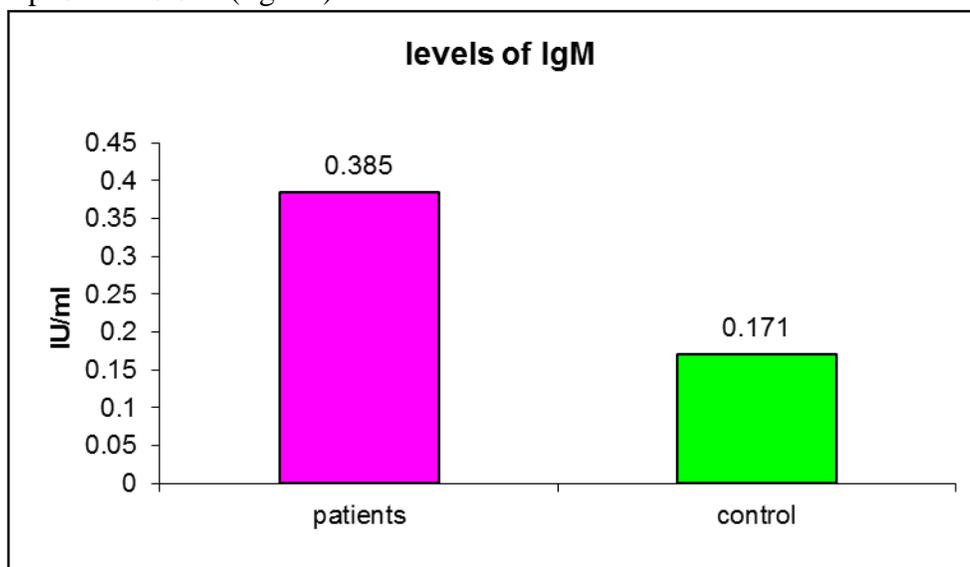


Figure-11: Serum levels of IgM in patients with Toxoplasmosis

Discussion:-

Epidemiological data in this study demonstrate a clear increment in the prevalence of seropositive patients women with *T. gondii* infection which revealed 63% by LAT. test. (fig. 1) This result was in correspondence with the results of previous studies, in Al-Qadisiya found that the prevalence of seropositive patients women with *T. gondii* infection were revealed 62.4% (17), in Al-Qadisiya 60.86% (18), and it is nearly similar to other Iraqi studies carried out in other cities by (19) in Baghdad 60.21%, in Najif 59.9% by (20), in Duhok 59.4% by (21). This similarity may belong to availability of the same appropriate conditions including temperature and humidity that allow to the longer infectivity and viability of the Oocysts which considered as a main source for infection spread in these cities. The prevalence rate of IgG- ELISA was 60% fig.(3.2) which indicate to the chronic infection by toxoplasmosis, The ratio of the present study IgG-ELISA is nearly agreement to the result recorded by (22) in Erbil city 60%, in sulymania city 65% by (23). While the prevalence rate of IgM-ELISA was 34% (fig.3) which indicate to the acute infection by toxoplasmosis, The ratio of the present study IgM-ELISA is nearly agreement to the result recorded by (23) in sulymania city 35%, in Al-Kut city 31% by (24), This may be interpreted by continuous exposure of women to the risk factors of *T. gondii* infection through their routine house works like minced contaminated meat products, gardening and contact with soil especially in rural women, eating of raw or unwashed vegetables and fruits and drinking of municipal water from contaminated reservoirs ,in addition to the widespread of stray cats which play an essential role in the distribution of infection (25). This result showed that highest number of patients women was

in the age group (20-30)(68.2%) and (30-40)(68%)years by using LAT. test (fig.4), this result is in agreement with (26) in Hilla city and (27) in Al-Najif city. While the highest number of patients women was in the age group (20-30)(65.5%) and (30-40)(64%)years by using ELISA-IgG (fig.5), this result is in agreement with (28) in Qatar and(29) in Cameroon, this finding due to that this age group most exposure to risk infection sources that lead to chronic infection with toxoplasmosis(30). The highest number of patients women by using ELISA-IgM was in the age group (10-20) years(61.9%), this result is in agreement with (31) in Kirkuk city, (32) in Tikrit city and (33) in China. This finding due to that this age group represent optimum period for fertility of women's life and The higher rate of infection among this age group of housewives due to that housewives being in direct contact with infection through handling and preparing of food (contaminated meat and vegetables) in addition to cleaning of house garden contaminated with cat feces that leads to acute infection with toxoplasmosis(34).The prevalence of *T. gondii* by sing both ELISA(IgG& IgM) and LAT. test according this study appears geographically concentrated in the high density areas especially cities and towns, like the center of the province of Al-Diwania and Al- Hamza area which was remarkably of high density in comparison with other regions, aggregation of infections appeared clearly in the areas which characterized by poor hygienic and of low educational levels, which also contain incomplete or bad waste disposal system. Endemicity of Al-Hamza may be due to its location south of the province that's to say, increase the risk from the wastes carried by the river and also the primitive , hygienic, social and educational levels. (30) found that the prevalence of toxoplasmosis infection in urban regions were higher than those rural regions.

Many previous studies are focused on role of humeral immune response represent by immunoglobulin such as IgG and IgM in resistance of *T. gondii* infection. In the present study, the patients women showed increased production of the IgG in comparison with healthy control group that demonstrate presence chronic infection with toxoplasmosis (fig.10), this result is nearly agreement to the result recorded by (35), who referred by his study that the high ratio of IgG levels in patients women due to that IgG is the only immunoglobulin can transfer to fetus through placenta, this result also is nearly agreed with (36,37). In this study, the concentration of IgM antibodies in patients women infected with *T. gondii* was statistically significantly higher than in healthy subjects (fig.11), thus suggesting an acute form of invasion. Increased IgM level correlates with early acute inflammation or with a reactive form of toxoplasmosis. However, negative IgM test result does not exclude acute toxoplasmosis (24), this result is nearly agreement to the result recorded by (38,39).

Reference :-

- (1) Miller, N.L.; Frenkel, J.K. and Dubey, J.P.(1972). Oral infections with *Toxoplasma* cysts and Oocysts in felines, other mammals, and in birds. J. Parasitol. V.(58): NO.(9), Pp.28-37.
- (2) Asgari, Q. Mehrabani; M.H. Motazedian; M. Kalantary and S.J. Adnani Sadati, (2011). The viability and Infectivity of *Toxoplasma gondii* Tachyzoites in Dairy products undergoing food processing. Asian Journal of animal sciences, 5(3): Pp.202-207.
- (3) Kang, K.M.; Lee, G.S.; Lee, J.H., Choi, I.W.; Shin, D.W. and Lee, Y.H., (2004). Effects of iNOS inhibitor on IFN- γ production and apoptosis of splenocytes in genetically different strains of mice infected with *Toxoplasma gondii*. Korean J. Parasitol. V.(42): Pp. 175–183.
- (4) Hill, D. and Dubey, J.P. (2002). *Toxoplasma gondii* transmission , diagnosis and prevention. Clin Microbiol Infect. V. (8):Pp. 634-640.
- (5) Waree, Phuangphe (2008). Toxoplasmosis: Pathogenesis and immune response. Thammasat Medical Journal, V. 8 No. 4, Pp. 487-496.
- (6) Nijem, K.I. and Al-Amleh, S. (2009). Seroprevalence and associated risk factors of toxoplasmosis in pregnant women in Hebron district, Palestine. Eastern Mediterranean Health Journal, V. (15), No. 5, Pp. 83-109.
- (7) Dawson, S.B. and Trapp, R.G. (1994). Basic and Clinical Biostatistics. Appleton and Lange: Norwalk, CT.
- (8) Al- Khufagi, Aqeel A.K.:(2011). Occurrence study of human cytomegalovirus and toxoplasmosis infection among miscarriage women in Al-Qadisiyia province. M.Sc. Thesis, Al-Qadisiyia University , Medical College, Iraq.
- (9) Al-Ramahi, H. M.; Aajiz, N. N.; and Abdlhadi, H. (2005). Seroprevalence of toxoplasmosis in different professional categories in Diwanyia province. J. Vet. Med.; 4(1): Pp.30-33.
- (10) Abbas , M.M.A. (2002). Seroepidemiological study with ahistory of abortion .M.Sc. Thesis, Medical College, Nahrain University , Iraq.
- (11) A'aiz, Noaman Naji. (2010). Genotyping Analysis To Determine The Lineages Types Of *Toxoplasma gondii* With Study Of Autoantibodies Production. P.D. Sc. Thesis. College of medicine. Kufa university, Iraq.
- (12) Razzak , A. H., ; Wais , S.A. and Saeid , A.Y.(2005). Toxoplasmosis the innocent suspect of pregnancy wastage in Duhok , Iraq . Eas.Medi. Hea . J. , 11(4) :Pp. 625-632.
- (13) Abubaker, S. and Dakhil, V. (2008). Seroprevalence of toxoplasmosis in women with spontaneous abortion. Zanco J. Med. Sci ., 12(2):8.
- (14) Kareem, L.A. M.(2007). study some Epidemiological and Immunological on *Toxoplasma gondii* in Al-Sulmaniyia province. M.Sc. Thesis, Science College,Baghdad University, Iraq.
- (15) Al- Saidi, M. (2009). Serological detection of toxoplasmosis among women in Wassit province. Wassit J. Sci. Med., 2(1): Pp.150-156.
- (16) Buffolano, W.; Gilbert, R.E.; Holland, F.J.; Fratta, D.; Palumbo, F. and Ades , A.E. (1996). Risk factors for recent *Toxoplasma* infection in pregnant women in Naples. Epidemiology and Infection; V.(16): Pp. 347-351.
- (17) Mohammed, G. J. (2008) . study the role of Toxoplasmosis , Cytomegalovirus and phospholipids in cases of abortion among women in Hilla city . M.Sc. Thesis , College of Medicine, University of Babylon ,Iraq.
- (18) Al-Kalaby, R. F. (2008). Sero-epidemiological study of toxoplasmosis among different groups of population in Najaf city, M. Sc. Thesis. College of medicine. Kufa university. Iraq

- (19) Abu-Madi, M.; Al- Molawi, N. and Behneke, J. (2008). Seroprevalence and epidemiological correlates of toxoplasma gondii infections among patients referred for hospital - based serological testing in doha, Qatar. Qatar parasites and Vectors J.1(39): Pp.1-4.
- (20) Njunda, Anna L.; Jules, C.N.; Assob, Dickson S. and Vuchas, C.Yugah, (2011). Seroprevalence of *T. gondii* infection among pregnant women in Cameroon. Journal of Public Health in Africa, V.(2): Pp. 98-100.
- (21) Diaz-Suarez, O. and Estevez, J., (2009). Seroepidemiology of toxoplasmosis in women of childbearing age from a marginal community of Maracaibo, Venezuela. Rev Inst Trop Sao Paulo, 51(1): Pp.13-7.
- (22) Othman, Nazakat Fakhraddin.(2004). Seroprevalence study of *Toxoplasma gondii* among pregnant women in Kirkuk City M. Sc. Thesis, Medicine college, Tikrit Univ. Iraq. Pp. : 70.
- (23) Ageel , N.F. (2003). Serological and biochemical study of toxoplasmosis in Tikrit teaching hospital . M.Sc. Thesis , College of Medicine , Tikrit University,Iraq.
- (24) Xiao, Yue; Jigang, Yin; Ning, Jiang; Mei, Xiang and Qijun, Chen (2010). Seroepidemiology of human *Toxoplasma gondii* infection in China. BMC Infectious Diseases, Pp.10- 4.
- (25) Jones, J.L.; Fung, C.P.; Shokeir, M.O. and Tom, H. M., (2009). Risk Factors for *Toxoplasma gondii* infection in the United States. Clin. Infect. Dis. V. (49): Pp. 878-884.
- (26) Yasodhara, P.; Ramalakshmi, B.A. and lakshmi, V. (2004). Socioeconomic status and prevalence of toxoplasmosis during pregnancy. Indian J Med Microbiol., V. (22): Pp. 241-43.
- (27) Tabbara, K. S. and Saleh, F., (2005). Serodiagnosis of toxoplasmosis in Bahrain. Saudi Med. J.; 26(9): Pp.1383-1387.
- (28) Al-Hindi ,Adnan, I. and Abdel Monem, H. Lubbad.(2009). Seroprevalence of toxoplasmosis among Palestinian aborted woman in Gaza. Annals of Al-Quds medicine. (5): Pp. 39-47.
- (29) Khurana, S.; Bagga, R.; Aggarwal, A; Lyngdoh, V.; Shivapriya, Diddi K. and Malla, N.(2010). Serological screening for antenatal toxoplasma infection in India. Indian J Med Microbiol, 28(2): Pp.143-6.
- (30) Srirup, A. Pal; Nibedita, Das and Pal, D., (2011). Sero-prevalence and risk faktors of *T. gondii* in pregnant women in Kolkata, India . Journal of recent advance in applied science (JRAAS), V. (26): Pp.27-33.

دراسة مصلية وبائية لطفي المقوسة الكوندية *Toxoplasma gondii* في محافظة القادسية

زياد متعب ديوان بليغ عبد الزهرة
جامعة القادسية / كلية العلوم

الخلاصة:-

أجريت هذه الدراسة من اجل الكشف عن بعض الجوانب الوبائية والمناعية عند النساء المرضى من سكان محافظة القادسية المصابات بداء المقوسات الكوندية ومقارنتها مع مجموعة النساء الأصحاء، في الفترة من شهر كانون الثاني 2011 ولغاية شهر حزيران 2011.

جمعت عينات الدراسة الحالية من مستشفى الديوانية العام ومستشفى الولادة التعليمي في الديوانية ومستشفى الشامية العام ومستشفى الحمزة العام ومستشفى عفك العام وبعض المختبرات الأهلية في محافظة الديوانية وتضمنت 332 عينة دم من النساء الوافدات إلى الأماكن المذكورة أعلاه ممن تراوحت أعمارهن من سنة واحدة إلى أكثر من 50 سنة ووجد أن مجموعة المرضى تتكون من 290 من النساء اللواتي يعانين أغلبهن من حالات إجهاض سابقة و 42 من النساء الأصحاء كمجموعة سيطرة.

حيث أظهرت نتائج التشخيص المناعي لعينات مصول النساء اللواتي عانين اجهاضات سابقة أو ولادات ميتة أو مشوهة باستعمال اختبار Latex أن نسبة الإصابة الكلية بلغت (63%)، أما باستعمال فحص ELISA- IgG حيث بلغت نسبة الإصابة المزمنة الكلية (60%)، وباستعمال فحص ELISA-IgM بلغت نسبة الإصابات الحادة (34%).

أوضحت الدراسة الوبائية بان أعلى نسبة أصابه عند النساء ممن تراوحت أعمارهن بين 20-30 سنة وبنسبة أصابه بلغت 68.2% باستعمال فحص اللاتكس، أما باستعمال فحص ELISA-IgG كانت أعلى نسبة إصابة تركزت بين النساء ممن تراوحت أعمارهن بين 20-30 سنة وبنسبة إصابة بلغت 65.5%، أما باستعمال فحص ELISA-IgM إن أعلى نسبة إصابة تركزت بين النساء ممن تراوحت أعمارهن بين 10-20 سنة وبنسبة إصابة بلغت 61.9%.

أن التوزيع الجغرافي للإصابة بطفي المقوسة الكوندية لوحظ في كافة أرجاء المحافظة مع زيادة واضحة في مركز محافظة القادسية (مدينة الديوانية) وفي مناطق قضاء الحمزة الشرقي. ففي مدينة الديوانية كانت نسبة انتشار الإصابة بطفي المقوسة الكوندية باستعمال اختبار اللاتكس 47%، في حين كانت نسبة انتشار الإصابة في قضاء الحمزة الشرقي 20%، أما باستعمال فحص ELISA-IgG كانت نسبة انتشار الإصابة المزمنة بطفي المقوسة الكوندية في مدينة الديوانية 48%، في حين كانت نسبة انتشار الإصابة المزمنة في قضاء الحمزة 20% بينما بلغت نسبة انتشار الإصابة الحادة بطفي المقوسة الكوندية في مدينة الديوانية 38.54% باستعمال فحص ELISA-IgM في حين كانت نسبة انتشار الإصابة الحادة في قضاء الحمزة 22.92%.