

Incidence of *Toxoplasma Gondii* and Relationship with Some Inflammatory Factors in Babylon Province

Widad Hashim Yahya Almuhana¹, Ahmed Khudhair Al-hamairy²

¹M.Sc, Lecturer, Biology Department, College of Education for Girls, kufa University,

²Ph.D, Professor, College of Science for Women, University of Babylon, Babylon, Iraq.

Abstract

The study included collecting (60)-blood samples from people who were attending the Children's Maternity Hospital in Babylon Province, then the Latex test was used to diagnose Toxoplasmosis. The results of the study showed that the percentage of infection with toxoplasmosis in Babylon Province was (11.66%), the infection (IgG) for females was (9.61) out of (52)-samples, and the injury (IgM) for females was (3.84) out of (52) samples, whereas the infection was for males in relation to:

IgG (0%) out of (8 samples) for the total percentage of IgG-against is(8.3%)

IgM (0%) out of (8 samples) and the total percentage of IgM- antibody is(3.3%).

Upon detection of (CRP)-proteins, the study included collecting (60)blood samples for people who were referred to the Children's Maternity Hospital in Babylon Governorate, and then the(CRP)-test and its relationship to toxoplasmosis were used. The study results showed that the total percentage of active phase proteins for people with toxoplasmosis in Babylon Province, it reached 50% ((the percentage was in females by(53.84%) while the percentage in males was 25%)). The current study showed that the percentage of sensitivity of (IgG, IgM)-antibodies is (8.3%, 3.33%) respectively while the percentage of specificity of (IgG) and (IgM)-opposites was (91.66%, 96.6%) respectively.

Objectives of The Study: Because of the recent spread of toxoplasmosis infection and the increase in miscarriage rates among pregnant women, the present study aimed to determine the infection of this parasite in Babylon Governorate between males and females alike, as well as to know the prevalence of toxoplasmosis and its relationship to the active phase proteins CRP

Keywords: *Toxoplasmosis, IgG, IgM, Toxoplasma, gondii, AIDS, CRP, spread, pregnant, female.*

Introduction

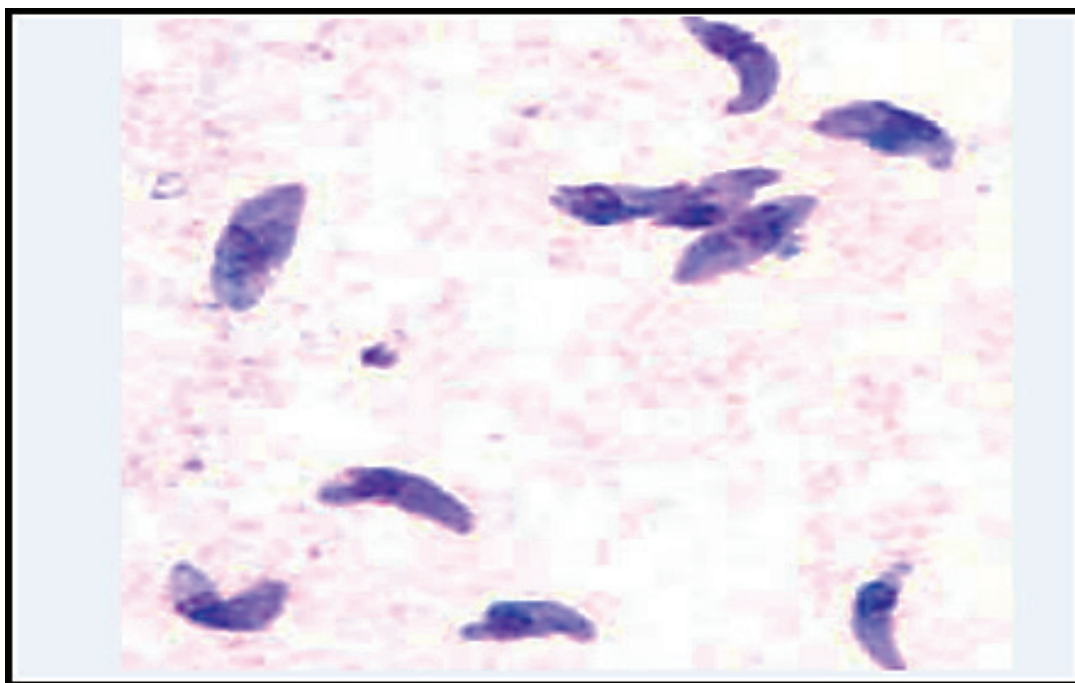
Toxoplasmosis is an infection caused by a single-celled parasitic organism called a pimple or *Toxoplasma gondii*, which is transmitted to humans through meat that has not been adequately cooked, or through direct contact with animals (especially cats)⁽¹⁾.

Usually its symptoms and signs are mild, but in people who suffer from (AIDS) it may lead to severe infection in the brain, while in fetuses that have suffered injuries in early stages of pregnancy may lead to blindness or underdevelopment⁽²⁾.

Corresponding author :

Widad Hashim Yahya Almuhana

E-mail: Widad.H@gmail.com



Figure(1):Bradyzoites(parasite)reveals in this sample

Gondii curvature (*Toxoplasma Gondii*) is a unicellular parasite that spends most of its life in the carrier of the cat family, especially domestic cats. One of these cat-carrier parasites can transmit huge amounts of it daily, through feces and secretions, which may come in contact or contact with the human being. In addition, toxoplasmosis can travel between all pets that live in one place of residence. The curvaceous parasitic parasite (or *gondii*) parasite is transmitted to the human body by mouth, when eating. A person who is not keen on washing his hands well after touching pet supplies, exposes himself, to a large extent, to this infection. Another additional possibility of contracting toxoplasmosis is eating meat that has not been properly cooked. Because the condylomed parasitoid (*Gondii*) multiplies in the digestive system, it can spread throughout all body tissues, including the brain⁽³⁾ and blood circulation. The main organs targeted by the parasitic condyloma (*gondii*) are: skeletal muscles, heart muscle, eyes, lymph nodes and lungs. As for patients who suffer from a weak immune system and suffer from diseases, such (AIDS), cancer, or who are being treated with drugs that suppress the immune system, they are more susceptible to infection with toxoplasmosis, in its effective and dangerous form, as a result of exposure to the (*Toxoplasma gondii*) parasite again, or due to

viruses in Dormant (dormant) has been developed since a previous infection. This situation is especially dangerous for AIDS⁽⁴⁾ patients who, if they have a dormant virus (in the dormant phase) and not treated as it should, could cause severe and severe infections of the brain (encephalitis) that could eventually lead to seizures, convulsions and neurological complications⁽⁵⁾.

Literature Review

The *Toxoplasma gondii* parasite is known to cause Toxoplasmosis. It was discovered for the first time before the knowledge that it was a disease in humans was by Laveran in (1900), as explained, but the most important and detailed discovery occurred in the year (1908) by Nicolle and Manceaux confirmed its name in the year (1909) and that During their studies on the northern African biting, Jerusalem, called *Cteriodactylus gondii*, in the Pasteur Laboratories in Tunis, who gave the currently known name to this parasite, the parasite was described in great detail. Around the same time and elsewhere, the scientist Splender described the parasite in a laboratory bunny in São Paulo, Brazil. The first discovery of this disease in an adult human was by the researcher Darling in the year⁽²⁾ (1908) in Panama, but the first case of toxoplasmosis in an infectious fetus Toxoplasmosis was recorded in humans in (1923), when

he was suffering from a deformed head Hydrocephalus and a small size of the eyes micro-phthalamia. In the late(1930s) and early forties, toxoplasmosis was considered an important infectious disease that affects humans, while Dubey and Beattie stated that the first offensive case of toxoplasmosis in cats was recorded in(1942), when the parasite was identified in the feces of cats after contact with mice infected with the *Toxoplasma gondii* parasite. The infection occurs through the formation of egg sacs inside the intestines of cats, and from it the role of cats in the transmission and spread of the disease was emphasized⁽³⁾. In Iraq, *Toxoplasma gondii* was recorded for the first time by Machattie in(1939) when he observed the parasite in the spleen and lung swabs of a loose dog in Baghdad conducted⁽⁴⁾ an epidemiological study in Baghdad to determine the rate of infection with toxoplasmosis in women suffering from Miscarriages, the number of serum wave cases reached (128), i.e. 34.7%, for (369) serum mammograms for women suffering from miscarriages through the use of the (IFAT) selection, the yeast linkage for immune absorption (ELISA) and the use of the (LAT-latex) test.

Classification of The Parasite:

The final classification of the parasite, as noted⁽³⁾ by researchers:

Kingdom :Protista

Phylum :Apicomplexa

Class :Sporozoa

Sub class :Coccidia

Order :Eucoccidia

Sub order :Eimeria

Family :Sarcocystidae

Sub family :Toxoplasmatinae

Genus :Toxoplasma

Species :gondii

Parasite Forms'

The parasite exists in three stages:

The active phase (rapid reproductive Hawin)

Tachyzoites: The name of the active phase with this name is due to the rapid reproduction of the parasite asexually by way of internal budding in the gaps between the cellular tissues of the different host body. This phase is characterized by its crescent shape with a pointed front end and a circular background with dimensions of (2-4) micrometers in width (4-8) micrometers in length, and this phase is observed in the acute stages of infection as well as in the chronic stages during re-infection. The parasite is surrounded by an outer envelope composed of an inner and outer membrane, a central nucleus, as well as mitochondria, the collagenous system and ribosomes. This phase is found in different body fluids for the middle and final host such as cerebrospinal fluid, peritoneal fluid and fetal fluid. It is also found in urine, milk, eye secretions, and mucous secretions of the host⁽¹⁾.

Slowly proliferating shunts and histocysts:

Bradyzoites and Tissue cysts, Tissue cysts form inside the host's cells to grow and remain in the cytoplasm of its cells with the continuation of the division of the slow-reproducing stages of Bradyzoites inside the cyst. The slow-split phase is similar in appearance to the fast-split phase except for the nucleus of this slow-phase, as it lies near the posterior end of the accurate and surrounds these phases. These phases are also called tissue cysts and that these bags vary in size, ranging in sizes between (100-200) micrometers depending on the numbers of slow-multiplying phases contained in a view that may reach (3000) organisms⁽¹⁾.

These cysts are commonly found in almost all organs during chronic authenticity and have spherical or semi-spherical shapes in the brain (central nervous system) and are compatible with the shape of muscles in the heart and skeletal muscles as well as in the liver, lung, and Czech. Activation cysts activate the ablation of the previous episode, so that the cysts exit the preceding proliferative episode. As well as they contain the red granules that take a red dye⁽¹⁾ when applying pyrodecics-Acid Schiff PAS⁽²⁾.

Oocysts-Unsporulated

They are spherical or semi-spherical in shape with a diameter of (10x12) microns. The bag wall consists of two transparent layers and no polar granules. The sporont often fills the egg bag and sporulation occurs outside the final host body within (1-5) days of its release depending

on moisture and heat. Whereas, the followed bags are semi-spherical to spindle-shaped with a diameter of (11-13) micron. At sporulation, each spore is divided into two splendid sporoblasts, which elongate to form a sporocyst inside each of them creating four spore cells. Egg sacs are the outcome of the sexual process that occurs in the intestine of the final host only⁽²⁾.

Unsporulated cysts are spherical or nearly spherical in shape and have a diameter of (12x10) micrometers, and the cyst wall consists of two transparent layers and no polar granules, and the two transparent layers form a durable double layer membrane. These cysts form in the epithelial cells of the final host intestine (cats). Unpaired cysts with feces are excreted to the outer circumference and those cysts may grow inside the cat's intestine to be the active phase. To two sporoblasts that elongate to form the sporocyst, within each of them, four sporozoites of (8x2) microns arise. Egg bags are the outcome of the sexual process that occurs for *La Asal*, The ovum bags are characterized by their resistance to harsh brown conditions for a long period of up to 18 months in humid⁽²⁾ environments. It was also noticed that they are not affected by most disinfectants, but they are quickly affected by drought and high temperatures⁽²⁾. Some insects such as flies, ants, and cockroaches, as well as air currents and rain, play a major role in contamination of human and animal foods. They also work to transfer these ovarian bags from one place to another. It was also found that only ten bags are sufficient to cause infection in humans, while the presence of (100egg) bags is required for the events of infection⁽²⁾.

Life Cycle: Knowing the parasite's life cycle is important for controlling the parasite and giving treatment to the patient as well as controlling its vectors and limiting its spread. Although the parasite was described early, knowing the full life cycle was not known until (1970) when Frenkel⁽²⁾ and his group were the first to assume the life cycle that we know is present for this parasite. Figure(1) shows the existence of two life cycles that include the sexual cycle or the enteroepithelial cycle and it occurs in cats only and the sexual cycle or the extra-intestinal cycle and occurs in cats and intermediate hosts that include many numbers of animals, including rodents, birds and all mammals, including humans⁽³⁾

Sexual Cycle: Most cats become infected after eating a bird or mouse (infected with a container of tissue cysts) or by eating food or water contaminated with followed (mature) egg sacs excreted in advance with the feces of other sucking cats, so the wall of these cysts will dissolve by proteolytic enzymes in the stomach and intestines and thus slowly proliferating spores and sporozoites are released in the gastrointestinal tract, which penetrate into the epithelial cells of the small intestine and then suffer from asexual reproductive divisions through endodyogeny and schizogeny, resulting in merozoites, and after several generations, some moles develop by the process of forming large gametocytes, producing large gametes, and female gametes Schoondermark-van de⁽³⁾ in 1995

After (3-10) days of infection, the segments spread along the small intestine, but they are more in the ileum, and these gametes unite to form a zygote or called a fertilized egg that becomes within a solid wall of development⁽⁴⁾. The ungrown egg sac will be thrown with the feces of infected cats for different times between (20-70) days of infection, as the egg sacs continue to be thrown until about the twentieth day, and the number of egg sacs reaches (100,000 eggs/g) of feces, and these cysts are strong and hard, not infectious, and it is possible to be kept in an outdoor environment for several months. Significantly resistant to dehydration, freezing and disinfectants, but may not be able to survive at (37 °C) for ten minutes, As for the dormant period, which is the period that precedes the laying of the egg sacs, it varies depending on the source of the infection, as it ranges between (3-5) days⁽⁴⁾ when the infection⁽³⁾ is by the tissue cyst, but when the infection occurs with rapidly reproducing vines, it is between (5-10) days and the egg sacs develop. If suitable environmental conditions are available to it, such as oxygen, suitable temperature and humidity, as these cysts swell and reach maturity within (1-3) days, as during this period the vascular vesicles are formed inside the egg sac by a process called sporogony and each sac contains two spore sacks, each containing four sporophytes, are a source of new infestation⁽³⁾

Asexual Cycle

The sexual cycle begins in humans and the rest of the other intermediate hosts, as well as cats as an

intermediate and final host is compulsory at the same time, when humans and other hosts eat the tissue bags found in the meat of infested animals that are not cooked well or egg bags that contaminate water and crops or when in contact with contaminated soil⁽⁴⁾. The sporophyte is released from the egg sacs and the slow-growing zygotes from the tissue sacs, and the intestine starts to turn into the rapidly proliferating venules that spread through the blood and lymph to the vital organs and tissues as the first reach of the mesenteric lymph nodes, followed by the liver and the rest of the other tissues, these organisms reproduce within cells by endogenous evolution, as their number reaches(6-18) of rapidly reproducing venules,

and as a result, the host cells infected with the parasite are destroyed (causing necrosis and inflammation)⁽⁵⁾. After about three weeks of infection, the presence of the parasite is reduced, and that humoral immunity develops. Tissue cysts begin to appear and locate in the nervous, muscle, and cardiac tissues, the diaphragm and the rest of the organs, and these cysts can remain throughout the life of the host, and when the body's immunity decreases, as in the case of pregnancy or infection with (AIDS), for example, or in people who are immunosuppressed as a result of giving them immunosuppressive drugs. In the case of organ transplantation, these cysts explode, and the slow-multiplication phase that is the beginning of a new asexual⁽⁵⁾ cycle is released:

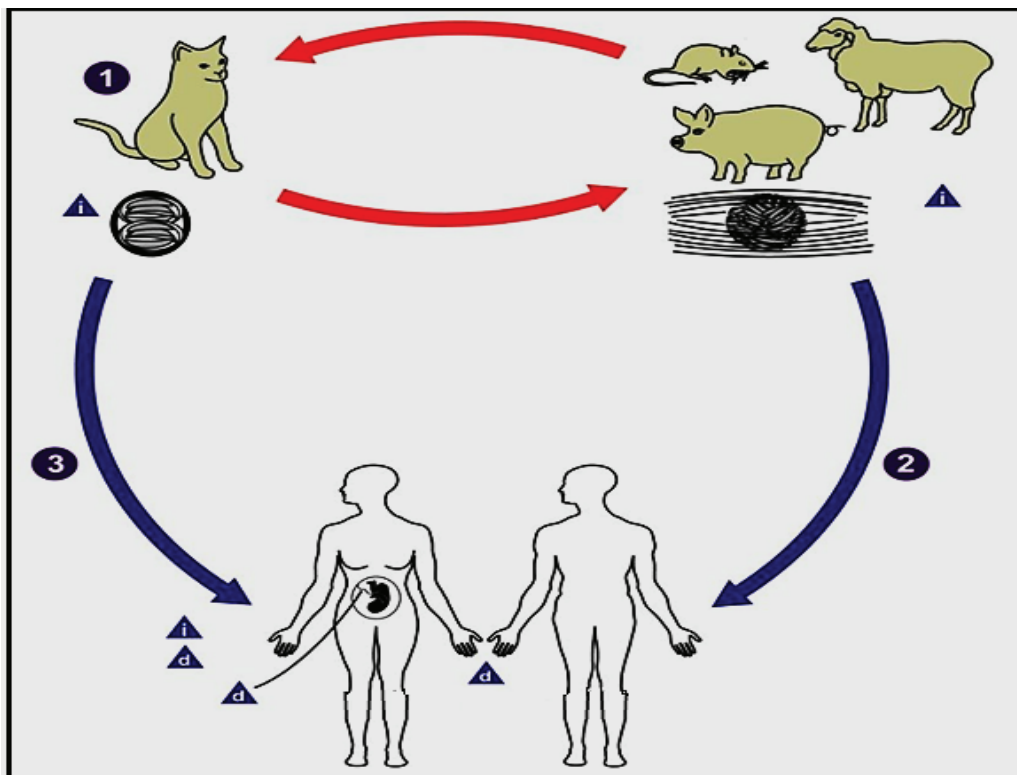


Figure.(2):The Parasite Life Cycle

Epidemiology

After toxoplasmosis is one of the most common diseases worldwide, as a study showed that nearly a third of the world's population is infected with this disease. It has become known that there is a close relationship between chronic toxoplasmosis and the ages of affected persons, as the rates of cationic seropositivity appear as

the age of those affected⁽⁶⁾ increases. Toxoplasmosis is one of the common diseases that are not clinically distinguished, as this disease is widespread (5-95%) in human societies, and it is also an important disease that causes miscarriage, recurrent miscarriage, premature birth as well as malformations. Studies have shown that infections are more common in hot areas than in cold

regions or mountainous regions, and that the variation in the prevalence rate of infection between geographical areas and between population groups within one area may be due to the difference in non-injury. In France⁽⁶⁾, a study conducted on both sexes, it was found that the high prevalence of infection, which amounted to (85%), was related to the population's preference for eating raw meat, which is the highest rate recorded in Europe, in Central America and in the United States. The incidence increases with the age of the injured to increase by an average of 0.5% to 1% per year of age & Krick. Although clinical toxoplasmosis usually affects only scattered individuals, but small epidemics may occur from time to time. An example of the same occurrence of toxoplasmosis among students of American medical colleges because these students used to eat undercooked pork from the college restaurants as well as what happened from another epidemic in one of the Canadian cities where it was found to be the result of contamination of the source Major Drinking Water for Egg Bags⁽⁷⁾. In Turkey found that the percentage of the eight positive pregnant women examined was(61.3%) ,and in another serological study in Turkey, the percentage of positive tests was(36.4%) of the people. Suspected toxoplasmosis. In a study to investigate antibodies in the serum of aborted women in Turkey, it found an(63.06%)⁽⁸⁾ immunoglobulin(g:A) in their serum., While in Iran, there was a variation in the incidence rate, as it reached in its north (70%), while in its south it reached 12%. But in some neighboring countries, including the Kingdom of Saudi Arabia, a study conducted among residents of the Eastern Province in Saudi Arabia showed that the incidence of toxoplasmosis⁽⁹⁾ (25%), Many local studies also indicated an increase in the incidence of toxoplasmosis in Iraq. In Baghdad, recorded an estimated incidence of (34.7%) in aborted women. In the year 2000, Al-Sammani recorded in Mosul an infection rate (39.33%) using the Latex test⁽¹⁰⁾ and(45.33%) using the indirect telegraphy test. The highest infection rates were recorded among women. Among the women under study, aborted survivors showed the highest incidence of latex grief test. (82.6%) and Daoud and his group (2009) also showed that the incidence of this parasite reached 85% in a study conducted on the group of women in Al-Diwaniyah Governorate

Al-Nasiri and Daoud also clarified that the incidence was(42% and 41%) among women who had abortions

and women who delivered normally, respectively. The study also showed that the percentage of congenital anomalies reached (7%) in children born to mothers with toxoplasmosis⁽¹¹⁾.

In Baghdad governorate, a study was conducted to find out the prevalence of infection among males and females, as(2012), Al.khushali found that the infection rate was(40%) and in males and females, respectively(46%).

Methods of Spread of Toxoplasmosis Infection:

There are many ways of transmitting the infection, which increases its spread in most of the developed and poor countries of the world alike the methods of transmission of infection to humans can be summarized according to their importance as follows⁽¹¹⁾:

1. Contaminated Food: This mechanism is one of the most important sources of protection, as it is possible for a person to acquire infection in one of the following methods: eat undercooked and colored meats, especially sheep and pigs, using contaminated food tools such as knives and cooking utensils, eat foods contaminated with uncooked and contaminated meat, eating infected sheep without heat treatment, eating fruits and vegetables contaminated with the excrement of infected animals or grown in soil contaminated with the parasite that causes the disease⁽¹²⁾.

2. From Animals to Humans: After human exposure to pets, especially cats, is one of the most common causes of parasite transmission, as the appropriate environment is prepared for its living and reproduction, and then its transmission to humans, and the person becomes ill while cleaning places where colored cats stay or comes into contact with contaminated cleaning equipment, and infection can also occur as a result of contact with contaminated soil when cleaning the garden The usual presence of cats in it, also showed that a pig or a large sheep may become an important epidemic source at any time, and certainly beef is one of the strong sources of infection, as the sanctuary pigs and sheep are the most vulnerable to pollution, even if it is It is clear that freezing below (14 °C) for several hours will kill most tissue cysts. Domestic cats will remain one of the dire sources of human infection. As for loose cats, they will lead to multiple problems due to the many

diseases that cats are reservoir hosts for their types. The prevalence of evening cats in rural areas compared to urban families led to a higher⁽¹³⁾ incidence of infection in rural families (54%) compared with urban (27%)⁽¹⁴⁾, and that the spread of the disease in animals was attributed to the high excretion of white sacs by cats. The infected ones that lead to the pollution of the surrounding environment, as pastures, water sources and fodder are contaminated, so the sheep seen in areas without cats do not become infected with toxoplasmosis, while those grazed in the same surroundings and in the presence of cats, the rate of infection with this disease was high and reached (12) in sheep and goats, it was observed that infection occurred due to exposure to stored feed contaminated with cat feces⁽¹⁶⁾. Although domestic cats are subject to good supervision and protection by kittens, whether in their food or their livelihood, they may not be free of taking infection indirectly from their environment, and it is possible to lay eggs for several days after injury. That these possibilities are a precursor to a pregnant woman to avoid direct and indirect contact with the necessity to stay away from her locations during at least the period of pregnancy⁽¹⁵⁾.

3. Congenital Transport: The parasite is transmitted from the infected mother to the fetus, causing congenital toxoplasmosis, when the mother acquires the infection during pregnancy, but in the case of a woman's infection before pregnancy, the transmission of the parasite to the fetus through the placenta is less likely except in the case of immunosuppressed women. This method is considered one of the most dangerous methods of infection with this disease, especially in the first months of pregnancy, as the disease is transmitted to the fetus through the mother's sucking placenta for the first time during pregnancy, and the rate of disease transmission from the infected mother to her fetus by the placenta method is (45%) ,but (60%) of the cases of infection The newborn has no symptoms, while miscarriage occurs in (9%) of cases, such as^(16,17) abnormalities of the nervous system, eyes and enlarged head⁽¹⁷⁾.

4. From Human to Another: The disease is transmitted from one person to another in very rare cases by organ transplantation, blood transfusion from an infected person to a healthy one, or laboratory personnel coming into contact with contaminated blood

or accidentally acupuncture. These cases are by means of preventive treatment until the disappearance of antibodies to the parasite is confirmed. Toxoplasmosis is treated by taking special drugs in doses according to the sex of the infected person. A growth-stopping effect and an influencing activity on the *Toxoplasma gondii* parasite encouraged its use in the treatment of toxoplasmosis., Therefore, it is considered one of the drugs of choice and common in the treatment of toxoplasmosis in pregnancy. In the event that the fetus is infected with the disease, it is necessary for the mother to take appropriate antibiotics such as Pyrimethamine or Sulfadiazine at low doses^(78, 79) of (25-50) mg per day for a full month, and (10mg) of folic acid should be taken daily⁽¹⁸⁾.

Experiments and Methods:

Study Location: The study was conducted in the Parasitology Laboratory in the Department of Life Sciences of the College of Sciences for Women, University of Babylon.

Sample Collection: 30 blood samples were collected from reviewers of both sexes for the laboratories of Maternity Hospital for Children. Use sterile plastic tubes to collect the samples (blood samples), then they are numbered and some private information is recorded for each references. The blood was separated by using a centrifuge at 3000 rpm for five minutes. Keep the work in numbered plastic tubes at a temperature of 25 ° C until the examination is done.

Serological Examination to Diagnose Toxoplasmosis:

Latex Agglutination Test CLAT: In this test, several commercial tests produced by a company called (S.A.SPAIN) and (SPINREA) were used to detect the presence of specialized antibodies against the parasite *Toxoplasma gondii* ,and the kit consists of the following components⁽¹⁹⁾:

1. Latex Reagent is a suspension of latex granules made from Polystyrene fertilizer and covered with antigen dissolving the parasite in a circulating saline solution that contains a preservative Sodium azid with a concentration(0.95%), that the latex granules enables to notice the correlation resulting from the interaction The antibody and the antigen with the naked eye or under

the microscope with a magnification power (10), as the clumping appears in the case of the presence of the serum antibodies to be examined.

2. Positive Control Reagent: It is a human serum that energizes the specialized antibodies against the anti-Toxoplasma parasite and contains(0.95%) of sodium azide.

3. Negative Control Reagent: It is animal serum free of specialized antibodies against the parasite, it contains(0.95%) of Sodium Azide. The kit should be kept in the refrigerator⁽¹⁹⁾, in degree 4”until use.

The Methods⁽¹⁹⁾:

1. (10 µl) of the sample was taken
2. This sample was mixed with latex reagent (5µl).

3. Then put Latex-cell slice

4. Then wait for(10) minutes until you notice the presence of the line or the mark by which the color changes to a red color or a red line

Note :

A . The line indicating (T1-Toxo IgG) indicates that the test is positive for this antibody.

B . The line indicating (T2-Toxo Tgm) indicates positive for this antibody.

C. If neither of the above statements appears, this indicates that the sample is negative

D . But if it appears to both of them, it indicates that both of the two opposites(Igm ,IgG) are positive.



Figure(3):Latex Cassett agglutination test for IgG and IgM

Methods for CRP

C-Reactive Protein: The concentration of the activity proteins is measured by the latex method. Latex, if detected by means of the Slide agglutination test, if the qualitative estimation and quantification of the quantitative ratio are used to measure the active phase protein and that the positive result is agglutination as a result of the removal of human antibodies working with the active phase protein with the active phase protein present in the patient’s serum sample⁽²⁰⁾.

Qualitative Method for Measuring of Protein Concentrations:

1. The reagent components and samples are left at room temperature.
2. A drop of serum was placed in the designated chamber on the test strip.
3. Put a drop of the reagent (CRP-Latex Reagent).

4. The two drops (serum+ reagent) were mixed well and then we spread well the circuit on the test strip⁽⁸⁷⁾.

5. The slide was moved in a circular motion for two minutes, as the result was shown in clumpy form.

Results and Discussion

The following table shows that the total number examined is 30 patients. If the percentage of infection was (IgG and IgM), as well as the total number examined and the number infected with toxoplasmosis and not infected:

The results in Table.(1), showed that the percentage of positive cases that appeared when using (C-Reactive Protein) for infected and non-infected cases of toxoplasmosis is (50%) of the number of samples of (60) samples.,Between the percentage of infection with toxoplasmosis and its relationship to the sex of the patient in (IgM), it was noticed that the infection was also concentrated in females by (3.84%),while it was also Table No.(1) act (0%) for males.

Table.(1):Resulting Data of Samples

Total No. Examined Samples(Infected, Not.Infected)			
Total Examined Samples	Not. Infected	Infected	Infection %
IgG : 60	5	55	8.3 %
IgM : 60	2	58	3.3 %
CRP : 60	7	53	11.66 %
Number of positive cases when detected by (C-Reactive Protein) for acute and non-toxoplasmosis cases.			
Total Examined Samples	Positive Cases	Negative Cases	Percentage %
60	30	30	50 %
Percentage of toxoplasmosis and its relationship to the patient’s sex relative to(IgM)			
patient’s sex of IgM	Positive Cases	Negative Cases	Infection %
52	2	50	3.84 %
8	0	8	0 %
60	2	8	3.3 %

Which indicated that the percentage of infection with toxoplasmosis and its relationship to the patient’s psychological sex as for Table(2) for males. The (IgG) antibody, it was noted that the infection was concentrated in females by (9.61%),while it was(0)., The results showed Table.(2) that the percentage of infection with Saint Mary’s disease infected and not infected) and its

relationship to the sex of the infected patient. And non-infected) when measuring(C.reactive protein),females had a greater concentration of this protein by(53.84%), while males were(25%), while the total number of infection and its relationship to the concentration of acute phase proteins was(50%).

Table.(2):The percentage of toxoplasmosis infection for samples

The percentage of toxoplasmosis infection and its relationship to the patient’s sex with respect to (IgG) antibody				
patient’s sex of IgG	Examined Samples	Positive Cases	Negative Cases	Infection %
Males	8	0	8	0
Females	52	5	47	9.61
Total .No	60	5	55	8.3 %
The percentage of toxoplasmosis (infected and not infected) and its relationship to the patient’s sex when measuring(C.reactive protein)				
patient’s sex - measuring (C.reactive protein)	Examined No.	Positive Cases	Negative Cases	Percentage of Toxoplasmosis %
Females	52	28	24	53.84 %
Males	8	2	6	25 %
Total .No	60	30	30	50 %

Calculation of Average for Sensitivity and Specificity Rates

The percentages of sensitivity and specificity were extracted according to the rates shown below:

Sensitivity=number of Real positive cases / number of Real positive cases+number of false negative cases x100%

$IgG=5/5+55 \times 100\%=5/60 \text{ 8.3\%}$

$IgM=2/60 \times 100\%=3.33\%$

Specificity=number of Real Negative cases / number of Real Negative cases + number of false Positive cases x 100%

$IgG=55/5+55 \times 100\%=55/60 =91.66\%$

$IgM=58/60 \times 100\%=96.66\%$

Toxoplasmosis is an epidemic disease of global prevalence, especially in tropical and subtropical regions. Also, toxoplasmosis is spread in the environments in which it is spread and other animals that are domestic with humans. The unhealthy environmental conditions in

these areas are among the most important factors for the spread of this disease, in addition to the loss of personal hygiene factors, mixing with domestic animals and cats, and eating meat of animals that are not well cooked are among the most important factors in the spread of the disease, especially in Iraq. It was found from the current study that the ratio of (IgG) antibody in the current study and (IgM) antibody is consistent with the study and not consistent with the study. Perhaps these ratios are due to the difference in the size of the sample taken and the method of work used and it appears from the results. Compared with (IgM), this confirms that most of the infections are acute, given that the (IgG) antibody is associated with chronic infections, and (IgM) is associated with acute injuries. The results showed that the percentage of (IgG)-antibodies to (IgM) was the highest in females in disease resistance respectively compared to males (5%) for both antibodies and this is consistent with the study and not consistent with the study of both the studies, this is due to the size of the sample taken in the current study, as the number of samples examined was out of (30 samples) from different people, so this ratio appeared as we conclude that females are less immune than males in fighting germs and diseases. Finally, the current study showed that acute (CRP)-proteins and their association with toxoplasmosis appeared high with (IgG) antibodies and then (IgM). It is known that these proteins are immune proteins that are increased with chronic infections, which are mainly associated with (IgG) antibodies because they are associated with chronic infections. This is in agreement with the study and not in agreement with studies^(21,25).

Conflict of Interest: There is no any Conflict of Interest

Ethical Clearance: Ethics committee refer that there is no plagiarism and there is no mistakes or wrong results in this work.

Source of Funding: Self funding.

References

1. Ahmed Yassin Zaman . Toxoplasma gondii among the aborted women who reviewed the Tikrit Teaching Hospital, M.Sc Thesis ,College of Education for Girls, Tikrit Community, (2008).
2. Sura Salem. The effect of some chemicals on the immune response of the mixture in experimental mice with toxoplasmosis. Letter of bombing of the College of Veterinary Medicine, University of Mosul, 2009, P: 132 .
3. Al-Jalal, Sanaa Muhammad. A study of some biochemical and physiological criteria in women with toxoplasmosis in the province of Najaf, M.Sc-thesis, College of Education for Girls, University of Kufa., 2011, P:137 .
4. Abdul Al-Ameer. Z. I .Al-Hamairy,A. K. Dakel Ghani Omran, D. G.Prevalence of Toxoplasmosis and Relationships With Estradiol Hormone and Vascular Cells Adhesion Molecular-1(VCAM-1). Indian Journal of Forensic Medicine & Toxicology,2020, 14(3):743-748.
5. Al-Hayali Sabah Saeed. An experimental study on Toxoplasma isolates from human placentas and evaluating the efficacy of a number of antibiotics in their novel treatment in mice in Nineveh Governorate, Ph.D thesis, Faculty of Science, University of Mosul, 2002, P:123 .
6. Alkhafaf, Farah Hazem. Isolation and a serological and epidemiological study of toxoplasmosis in women of childbearing age in Nineveh Governorate, M.Sc Thesis, Toxoplasma in the Faculty of Science, University of Mosul., 2001.
7. Al-Dujaili, Khatam Yahya. Serological and Epidemiological Study of Toxoplasmosis in Aborted Women in Baghdad. M.Sc Thesis, College of Veterinary Medicine, University of Baghdad, 1998.
8. Al-Sanjari, Raad Abd. Toxoplasmosis and its role in miscarriage and congenital malformations in humans and farm animals, Ph.D thesis of the College of Veterinary Medicine, University of Mosul.,2012.
9. Al-Gargouli, Najma Al. Prevalence of Ttaxoplasmosis among Diabetics in Babil Governorate, M.Sc Thesis, College of Science for Girls, University of Babylon., 2015.
10. Aziz, Ali Esmat. The effect of Toxoplasma gondii infection on the brain and eyes of fetuses and neonates and maternal placentas in albino mice. M.Sc-Thesis, College of Education, University of Tikrit, 2002,P: 107.
11. Al-Nasiri, Rania Ghassan , Dawood, Ibrahim. Changes in some biochemical tests in Toxoplasma Konidian women in Salah al-Din Governorate,

- Tikrit Journal of Pure Sciences, 2012,17 (3) , P:16-13.
12. ALHADRAAWY, S. K. ;ALMUHANA, W. H. and ALHADRAAWY, M. K. A.Hematological study for males infected with *Ascaris lumbricoides* in Al-Najaf Province, Iraq. International Journal of advanced technology and innovative research, 2014,6 (8):820-823.
 13. AlHamdani, M. M. and Mahdi, N. Toxoplasmosis among women with habitual abortion . East Medi Health J.,2009,3(2): 310-315 .
 14. Al-Hindi Zeana, Sh; Hawraa. aldahmush. Immunological study for *Toxoplasma gondii* parasite in college of science for women Babylon J. 2015,4(23): 7-16.
 15. Al-Khushali, Mahmoud, N. Al-khushali. Toxoplasmosis in Relation to Entameba Histolytica and Giant Lamblia Infection. Diyala Journal of Medicine,2012,2 (1): 37-45
 16. Al_Qrashi, A.,Ghandour, A. M, Obied, and Makki, S,M. Seropidemiological study of *Toxoplasma gondii* infection in the human population in the Eastern region. Saud. Med. J.,2001,22(1):13-18.
 17. Bayhan, G.,Suay, A., Atmaca, S. and Yayla, M.Toxoplasma seropositivity among pregnant women.Turk.parasitol. Derg.,1998,22(44):359-361
 18. Berktaş, Balci, I.,Yelmaz, H. and Bozkurt, H. Investigation of *Toxoplasma* antibodies in women patients with various obstetrical problem.,Turk. Parasitol. Derg.,1997,21(3): 249-251.
 19. Brisco, N.,Humphrys, J.G. and Dubey, J.P. Prevalence of *Toxoplasma gondii* infection in Pennsylvania black bears. J. Wildlife Dis.,1993,29(4) 299-601
 20. Carcia , J. L.; Navarro ,L. T.;Ogawa, L. Seroprevalence of *Toxoplasma gondii* in swine ,bovine ,ovine and equine and their correlation with human, felines, and canines from farms in north region of parana state ,brazil .Cienicia. Santa. Maria.,1999,29(1) :9 - 97.
 21. Cook, A.; Gillbert, R., W. and Semprini, A. Sources of *Toxoplasma* infection in pregnant women: European Multicenter case control study. Brit. Med.J.,2000,32(15): 142-147
 22. Dubey, J. P; Miller, N. L; Freskel , J. K. The *Toxoplasma gondii* Oocysts From Cat Faeces J. Exper. Med.,1970,132(3) 636–662
 23. Dubey, J. P.; Sheer, C.; Kwok, O. C. and Blixt, J. A. Oocyst induced murine toxoplasmosis: Life cycle, pathogenicity and conversion in mice fed *Toxoplasma gondii* oocyst. Parasitology, 1997,83(2): 724-727.
 24. Dubey, J. P.,Lindsay, D. S. and Speer, C. A. Structure of *Toxoplasma gondii* tachyzoites bradyzoites and sporozoites and biology and development of tissue cysts. Clin. Microb. Rev.,1999,11(2): 267-299.
 25. Shahmoradi, A., Rezaeian, M. and Asle, A.D. Sheep an important reservoir of human toxoplasmosis in Iran. Med. J. Iran,1993,7(3): 173-174.