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Sero-prevalence of *Toxoplasma gondii* among Diabetic patients in Thi-Qar province/ South of Iraq

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Abstract

Toxoplasmosis is one of the most widespread diseases in the world. It is known for being asymptomatic and affects all living organisms, including humans. The disease is caused by the *Toxoplasma gondii* parasite. Immunocompromised patients such as AIDS and diabetes ,are the most vulnerable group to infection .The main objective of this research is to detect the infection with *Toxoplasma gondii* among Diabetic patients by serological method (ELISA) in order to measure the level of IgG for 120 of diabetic patients and 60 healthy control .The results were showed that 35% of diabetic patients infected with *Toxoplasma gondii* compare to control 78.3% .The age of Diabetic patients who are infected with toxoplasmosis was 55-65 and consisted 11.6% rate of infection followed by 8.3% in 45-55 age group ,while the lower rate was 1.1% in age group of 75-85 years. Diabetic female 34.1% was highly infected with toxoplasmosis than male o.8%, and their residency were urban (24.1%).

Keywords: Toxoplasmosis, Diabetes mellitus, serology.

i. Introduction

Toxoplasmosis is a zoonotic disease that has a high prevalence in the world. It has been demonstrated that some communities have infections. This disease is caused by the parasite of *Toxoplasma .gondii* [1] *T. gondii* is neglected parasite the globally distributed Eukaryotic opportunistic pathogens. This single-celled parasite is expected to affect one-third of the global human population [2]. The most common mode of transmission is through the contaminated food, and also the transmission from infected mother to her fetus, or through blood transfusion and organs transplantation[3,6]. *T.gondii* has a entric cycle as well as an exoentric cycles, in cats have both life cycle while human has only Exoenteric cycle [7]. In immunocompromised patients, experience deadly and life-threatening conditions that causes miscarriage in infected mother. In chronic infection remind persistence for many years [8]. *Toxoplasma gondii* has three infective stage tachyzoites , bradyzoite and oocyste .It is believed that the tachyzoite of *T. gondii* to be a stage of growth that exhibits quick proliferating and dispersing, linked to acute infection in humans. The immune system of the host cell causes the tachyzoite to change into a bradyzoite [9]. Bradyzoites and tachyzoites have only minor structural differences. Unlike tachyzoites; which have a nucleus that is more centrally positioned, they have a nucleus that is located near the posterior end. Bradyzoites slowly development form and settle within tissue cysts Specifically in the eyes, muscle and central nervous system [10,11]. Oocyste is reproductive form characteristic by high resistance to the chemical and physical assaults [12]

The parasite remained persistent for many years in the body accompanied by destruction for many organs such as central nervous system leaded to more dangerous problems,eyes causes loss of vision, lung [13] *T.gondii* destruction of pancreas in chronic infection and causing diabetes [14] . Diabetic mellitus are a collection of metabolic illnesses collectively referred to diabetes.Diabetes is characterized by persistently elevated blood sugar levels [15].It results from either insufficient insulin production by the pancreas or improper insulin use by the body's cells[16] *T. gondii* uses glycolysis to quickly break down carbohydrates. Diabetes increases the risk of susceptibility to numerous infections because immune responses in the host cells prevent the maintenance of regular metabolic processes and lead to the development of disruptions [17,18]. Diabetic mellitus characterized by elevated blood sugar levels a hallmark of the metabolic illnesses (DM), which develop when the pancreas either stops producing insulin or releases it inadequately. A long-term vascular disease has been implicated as the cause of chronic hyperglycemia [19]the prevalence of toxoplasma and diabetic in population is very common [20]

ii. Methods:

a. Collection of blood samples

Blood samples were collected from 120 patients with diabetes those patients attended to specialized center for diabetes and endocrinology in Nassiriyah City/ Thi-Qar province /southern Iraq, during the period extending from July 2022 to November 2022 in addition 60 included control group ; Blood samples were placed in sodium citrate tube to performing a cumulative glucose analysis (HbA1C).Three ml of blood were placed in a gel tube to detect of *T.gondii* in the patient then stored in -20 °C till Confused re-write it [21,22] .SPSS was used as the statistical analysis system to

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analyze the findings of the current investigation. Chi sequare ($\chi 2$) and p-value indicated level significant between the samples

b. The Detection type of Diabetes by HbA1C test

The cobase equipment was used to measure the level of glucose in diabetes patients' blood samples once sampling was completed. This method involves mixing blood with a TTAB solution to eliminate WBC. Using the (HbA1c) Rocha Hitachi kit, the findings were obtained [23,24] .

c. The Detection of *T.gondii* IgG antibody

Employing the readily available kits (fine test kit) from Germany that were created in accordance with company production by using enzyme linked immunosorbent assay techniques,(ELISA) principle included The kit of(*T.gondii* IgG ELISA) used in this assay is soild phase enzyme linked immunosorbent dependens on *T.gondii* soulable antigen covered microtiter wells and before ready use this kit the serum of patients must be diluted and put both(diluent ,serum of patients) in microtiter wells which has antigen and then produce complex if (Ab) for infection of parasite is present and non if there is no infection after wash we removed all unbound sample . conjugcate (anti- human IgG antibody)used for filled microtiter wells to control material to form complex of enzyme linked immune ,the second washing is important to elimination unbound conjugated following other incubation if they present antibody against *T.gondii* are define by using material substrate A and B mix together gave a blue colour if they are not present there is not colour to stop change coloure to yellow used stop solution sulfuric acid ,by using the microtiter reader could calculated the concentration of colour and it is read in 450/620 nm.

iii. Results

The total number that included in the following study were 120 whom suffering from Diabetes for detection of toxoplasmosis .Table1 explains the prevalence of toxoplasma gondii (IgG) in diabetic patients and the control (healthy people) after using ELISA test; The results showed that 35% of Diabetic patients toxoplasmosis, Statistical' differences were highly significant where $P \leq 0.05$,

Table (1): prevalence of Toxoplasma gondii (IgG) in diabetic patients and control healthy people

Toxo IgG	Case	NO.(%)	Mean
Patient	positive	42(35%)	231
	Negative	78 (65%)	13.4
Control	Negative	47(78.3%)	6.9
	positive	13(21.6%)	233
Total NO of patients= 120		control =60	

$\chi 2$=7.840 df=1 p-value=0.005

high Significant differences $P \leq 0.05$

All age groups of diabetic patients were infected with chronic phase of toxoplasmosis that including in this study and the statistical analysis showed a significant difference between the age groups of Diabetic patients with toxoplasmosis where a high percentage of infection (11.6%) in age group 55-65 following by 8.3% in age group of 45-55 while the lower rate was 1.1% in age group of 75-85 years as shown in Table (2):)

Table (2):Age of Diabetic patients with toxoplasmosis (IgG)

Age	No.(%)	Mean
15-25	1(0.8%)	193.2
25-35	1(0.8%)	77.7
35-45	8(6.6%)	325.3
45-55	10(8.3%)	281.4
55-65	14(11.6%)	189.2
65-75	8(6.6%)	170.7
75-85	0(0%)	0
Total NO.patients =120		

$\chi 2$=183.603 df=5 p-value=0.000

significant differences $P \leq 0.05$

The seroprevalence of *T.gondii* in diabetic patients showed high significant in female (34.1%) than male (0.8%) of Diabetic patients with toxoplasmosis as shown in Table(3).

Table (3): Gender of Diabetic patients with toxoplasmosis (IgG)

gender	No.T.gondii(IgG%)	mean
Male	1(0.8%)	119
Female	41(34.1%)	233.7
Total NO.patients=120		

$\chi 2$=37.465 df=1 p-value=0.000

significant differences $P \leq 0.05$

The seroprevalenc of *T.gondii* in diabetic patients showed high significant between diabetic patients resident and *T.gondii* infection in urban area recorded 24.1% rate of infection with toxoplasmosis among diabetic patients and those in rural area recorded 10.8% rate of infections .As shown in Table (4) .

Table (4): Residency of Diabetic patients with chronic toxoplasmosis (IgG)

Residency	NO.%(IgG)	Mean
Urban	29(24.1%)	226.4
Rural	13(10.8%)	241.3
Total NO.patients =120		

$\chi 2$=13.286 df=3 p- value =0.004

significant differences P≤ 0.05

iv. **Discussion.**

The serological test is very important to diagnosis anti specific antibody in acute and chronic phase (IgM,IgG) of parasite *Toxoplasma gondii* in serum of diabetic patients.

The results showed a significant infection of 35% of Diabetic patients infected with toxoplasmosis in chronic phase (IgG)compare to control 21.6% by using enzyme linking immune assay kit ; The causes for increase in distribution of parasite were different health habits ,unintentionally consuming infected, undercooked meat or shellfish after handling ,frequent breeding of pets such as cats carry Oocyste of this parasite[25].This findings consistent with some investigations, for example the study of [26] conducted in Thi-Qar about the prevalence of *T.gondii* (21%)IgG [27];while (53%) of (IgG) indicated past infection of toxoplasmosis and in [28]. The outcome of this research is in a agreement with the results of the current study where about (29%) of positive infection with (IgG);There are some studies which disagree with the results of the current study such as[30] where indicated to high seroprevalenc for toxoplasmosis in acute stage (IgM)(43.8%) while (IgG) (33%)record the low prevalence for anti-*T.gondii* antibody in patients. Moreover, another study [31] recorded a high of percentage of recent infection (IgM) for anti-*T.gondii* antibody in the patients about (40%) while IgG (11%).Because immunocompromised for some patients that results from take some drugs or the source of nutrition or weak body structure as a result of exposure to pollutants and radiation resulting from wars.

The distribution of toxoplasmosis based on the age of diabetic patients in the current study showed a high significant consisting (11.6%) of infection among (55-65 year) age of patients following by (8.3%)in (45-55 year) age group while the lower rate was 1.1% in age group of 75-85 years . The most patients with DM due to the aging population, declining physical activity, unhealthy eating habits, the obesity pandemic, and lower diabetic death rates. The result of this study agree with [30] where high (71.1%) prevalence of infection were reported by this study in the age >=48 followed by (18.8%) in (36-47)and in[32] study recorded high infection with toxoplasmosis in diabetic patients (32.1%) in group of age (40-50 year) followed by (26.6%) in (50-60 year) and that based on enzyme liking immunosorbent assay kit ;This test is very important to detect qualitative and quantitative specific anti toxoplasmosis antibody in human serum there is another study in [33] in benghazi of Libya reported a high seropositive of *T.gondii* (34.8%) in group of age (52-62 year). Another study done by [34] showed a high percentage (42.3%) in effect age (35-45 year); In some studies such as [35] the results revealed a high percentage (34.78%) for anti-toxoplasma (IgG) between (20-29) while the proportions of (IgM) between (40-49 year) recorded (40%); The lowest percentages for the age categories 30 to 39 and 40 to 49 years, respectively, were (15.62%) anti-T.gondii IgG and (20%) anti-T.gondii IgM. Made it incompatible with the current results as for distribution among diabetic patients with *Toxoplasma gondii* .

The result of the- present study showed a high significant infection between sex of patients and infection with toxoplasmosis where diabetic female are more infected with toxoplasmosis than male where (34.1%)in female to(0.8%) in male. The reason for the difference may be due to change hormones ,mass and physical strength ,as well as the frequent exposure of women to the use of contamination meat and vegetable that they use for cooking , and the change in their physical composition during pregnancy. The outcome of this research is in consistent with other studies, for example[36]recorded seropositive of *T.gondii* in patients in female higher than male in percentages (30% and 21.7%) and also the study of [37] in Arbil province According to the findings of male(23.33%)and female (40%) by (IgG,IgM). Another study disagrees with the current outcome as appear in study of [38] where male infection rates was twice as high as female infection rates. Estimates for males and females respectively showed 3.3 and 1.7 occurrences per 1000 at-risk person-years and in another study [39] both males (27.6%) and females (23.2%) infected with toxoplasmosis and in this study [40] Participants were split evenly across sex, female (4.75%) and male (95.25%) of percentage due to Different feeding practices, degrees of close animal contact, especially with cats, climatic and socioeconomic characteristics in these nations, as well as sample size.

the residency of diabetic patients with toxoplasmosis were urban and more than rural (24.1%)(10.8%) based on the current studies, according to statistical analysis this difference may be as a result of the conditions of poverty, overpopulation, and poor water supply infrastructure. The results of this study are similar of other investigations like study of [41] revealed Urban participants made up 81.3% of the study population, while rural participants made up 63.1% and in Basra city from Iraq [42] recorded high rate of infection with toxoplasmosis in urban compare with rural area (58.2%)(41.8%) The results of this study were in contradiction to those of other investigations[43]

v. **conclusion:**

Diabetic patients can be infected with *Toxoplasma gondii* in 35% of total infection as chronic phase that indicated by IgG titer .

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