Serological assessment an infection with Toxoplasma gondii marriage applicants and blood donors

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Serological assessment an infection with *Toxoplasma gondii* marriage applicants and blood donors

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ABSTRACT

Background. Identification and serological study were conducted. For blood donors and applicants for marriage to investigate the infection with *Toxoplasma gondii* in Thi-Qar province
Methods. For both sexes during the period from on October 2023 until the end of January 2024 , the ELISA technique was used for 140 serum samples from blood donors and 160 serum sample from applicants for marriage, according to Serological criterion (sex, age group, area region, blood group).
Results. The total *toxoplasma gondii* positive rate was 32% using The ELISA antibody IgG and (22%) using the antibody for blood donors. The positive rate for antibody IgM was (22%) for blood donors and the positive rate for antibody IgG was 3%for applicants for marriage. The result showed that the prevalence of *toxoplasma gondii* was slightly higher in rural areas compared to cities.
Conclusion. Infection frequency was in males then females for blood donors and higher females than males for applicants for marriage in all age groups and blood donors. Generally, people over 36 old are more vulnerable to infection.

Keywords: *Toxoplasma gondii, ElSIA* technique, Blood donors, marriage applicants

Introduction

Obedient intracellular parasitic protozoa *T. gondii*, is the source of the zoonotic disease toxoplasma, which causes encephalitis, mental retardation, chorioretinitis, loss of vision in congenitally infected individuals, and miscarriage in livestock [1-3]. The infection is present all over the planet. This parasite has exposed around one-third of humankind, yet the seropre valence varies widely between population groups and countries (from less than 10% to more than 90%) [4]. People who are infected may not show any symptoms for the rest of their lives unless they experience immunosuppression [5]. The only animals that pass oocysts in their feces are felidae, or cats, who are both intermediate and definitive hosts. All other mammals and birds are considered intermediate hosts. Goat and sheep meats contain significant diseases. Toxoplasmosis sources [6]. Typically, diagnosis produced using molecular methods and/or immunological tests, or by combining these methods [7]. Indirect ELISA is one type of serological test that can be used to demonstrate IgM or IgG. It is a quick, easy, and reliable procedure [8,9]. The investigation of *Toxoplasma gondii* infection in blood donors and potential spouses without symptoms in the main blood and applicants is the goal of this study for the Thi-Qar marriage bank, employing the ELISA technique. the investigation of the impact of several parameters, including age, blood type, and sex and location of residence.

Method

Three hundred blood samples, ranging in age from 18 to 57, were collected from both healthy blood donors and potential spouses. Samples were taken from candidates for the Thi-Qar marriage facility and blood donors. Each subject had four milliliters of venous blood drawn from the radial vein. The serum was then pipetted into five Eppendrof tubing using a micropipette and kept for later use at -20°C.

Anti-T. gondii antibody (IgG) and (IgM) detection using ELISA technique: IgG and IgM antibody measurements were carried out and analyzed in accordance with the manufacturer's instructions.

Serological testing

Two kits from HMG, Germany were used for this assay, according to Laboratories, Inc. One was for the detection of IgG, while the other was for the detection of antibodies specific to IgM. T. gondii in the serum for humans.

Serological Testing (ELISA)

This assay was performed by using two kits (HMG, Germany) Laboratories, Inc. One was for detection of IgG and another for detection of IgM specific antibodies agains. T. gondii in the people serum.

Results

The table 1 present on blood donor and marriage applicants were tested for various factors. The results showed that in urban areas, 73,5%of blood donors were negative, while 22.4%were IgG positive. In rural areas, 71.4% of marriage applicants were negative, with 25.3% testing IgG positive. Overall, the total percentage of negative results was 80%, while 18.1% were IgG positive . No significant differences were found between urban and rural areas.

Table 1: Table 1 shows the prevalence of *Toxoplasma gondii* antibodies by residence area in blood donors and marriage applicants using the ELISA technique.

Applicants for marriage					Blood donor				
Residence	**IgG (+) No.(%)**	**IgM (+) No.(%)**	**(-) No.(%)**	**Total No.(%)**	**Residence**	**IgG (+) No.(%)**	**IgM (+) No.(%)**	**(-) No.(%)**	**Total No.(%)**
Urban	11 **22.4%**	2 **4.1%**	36 **73.5%**	49 **100.0%**	**Urban**	**9** **14.8%**	**1** **1.6%**	**51** **83.6%**	**61** **100.0%**
Rural	**23** **25.3%**	**3** **3.3%**	**65** **71.4%**	**91** **100.0%**	**Rural**	**20** **20.2%**	**2** **2.0%**	**77** **77.8%**	**99** **100.0%**
Total	**34** **24.3 %**	**5** **3.6%**	**101** **72.1%**	**140** **100.0%**	**Total**	**29** **18.1%**	**3** **1.9%**	**128** **80.0%**	**160** **100.0%**

Cal.X2:0.17 Tapx2.9.21 df:2 p-value:o.9 Cal.X2:0.80 Tab.x29.21 df:2 p-value:0.66

The table 2 present data on blood donors male 70 total Negative 61(87.1) IgM positive (1.4%) IgG positive 8(11.4) female 90 total Negative 72(80%) IgM positive 4(4.4%) IgG positive 14(15.6%). Applicants for marriage male 132 total Negative 98(74.2%) IgM positive 2(1.5%) IgG positive 32(24.2%) female 8 total Negative 2(25%) IgG positive 6(75%). Total Male 160 negative 133(83.1%) Igm positive 5(3.1%) IgG 22(13.8%) female 140 total negative 100(71.4%) IgM positive (71.4%) IgG positive38 (27.1%).

Table 2. ELISA was used to determine the prevalence of *toxoplasma gondii* antibodies by sex in blood donors and marriage candidates.

Applicants for marriage					Blood donor				
Gender	IgG (+) No.(%)	IgM (+) No.(%)	(-) No.(%)	Total No.(%)	Gender	IgG (+) No.(%)	IgM (+) No.(%)	(-) No.(%)	Total No.(%)
Male	32 24.2%	2 1.5%	98 74.2%	132 100.0%	Male	8 11.4%	1 1.4%	61 87.1%	70 100.0%
Female	6 75.0%	0 0.0%	2 25.0%	8 100.0%	Female	14 15.6%	4 4.4%	72 80.0%	90 100.0%
Total	38 27.1%	2 1.4%	100 71.4%	140 100.0%	Total	22 13.8%	5 3.1%	133 83.1%	160 100.0%

Cal.x2:9.84 Tab.x2.9.21 df: 2p-value :0.00 Cal.x2:1.87 df:2 p-value:0.39

The table 3 presents data on blood donors and applicants for marriage, categorized by age groups and antibody test results. The results show varying percentages of positive and negative cases for IgM and antibodies in different age ranges. The data indicates a higher percentage of positive IgG cases in older age groups while a decrease in positive IgM cases as age increases. The total number of cases analyzed is 160 with a breakdown of antibody test results provided for age group. The data highlights the importance of age in antibody test results among blood donors and marriage applicants.

Table 3: *Toxoplasma gondii* Antibodies' Prevalence in Marriage Applicants and Blood Donors Determined by ELISA according to age group.

Applicants for marriage					Blood donor				
Group	**IgG (+) No.(%)**	**IgM (+) No.(%)**	**(-) No.(%)**	**Total No.(%)**	**Residence**	**IgG (+) No.(%)**	**IgM (+) No.(%)**	**(-) No.(%)**	**Total No.(%)**
17-21	**2 18.2%**	**0**	**9 81.8%**	**11 100.0%**	**17-21**	**6 13.6%**	**1 2.3%**	**37 84.1%**	**44 100.0%**
22-26	**3 16.7%**	**1 5.6%**	**14 77.8%**	**18 100.0%**	**22-26**	**5 17.2%**	**2 6.9%**	**22 75.9%**	**29 100.0%**
27-31	**5 21.7%**	**1 4.3%**	**17 73.9%**	**23 100.0%**	**27-31**	**4 11.1%**	**1 2.8%**	**31 86.1%**	**36 100.0%**
32-36	**7 35.0%**	**0**	**13 65.0%**	**20 100.0%**	**32-36**	**4 16.0%**	**0**	**21 84.0%**	**25 100.0%**
37-41	**6 20.0%**	**0**	**24 80.0%**	**30 100.0%**	**37-41**	**2 10.0%**	**0**	**18 90.0%**	**20 100.0%**
More than40	**9 23.7%**	**0**	**29 76.3%**	**38 100.0%**	**32-36**	**2 33.3%**	**0**	**4 66.7%**	**6 100.0%**
Total	**32 22.9%**	**2 1.4%**	**106 75.7%**	**140 100.0%**	**Total**	**23 14.4%**	**4 2.5%**	**133 83.1%**	**160 100.0%**

Cal.x2:7.21 Tab.x2.23.21 df:10 p-value :0.70 Cal.x2:6.33 df:10 p-value:0.78

The table 4 shows data on blood donors and marriage applicants, focusing on blood group and antibodies. It includes counts and percentage for blood groups A, B, AB, O, as well as IgM and IgG antibodies. The total count and percentage for all blood groups are provide. The analysis includes the p-value, degrees of freedom, and chi-square value. The result indicates the distribution of blood types.

Table 4: Prevalence of *Toxoplasma gondii* Antibodies in Marriage Applicants and Blood Donors Determined by ELISA according to blood group.

Applicants for marriage					Blood donor				
Blood group	**IgG (+) No.(%)**	**IgM (+) No.(%)**	**(-) No.(%)**	**Total No.(%)**	**Blood group**	**IgG (+) No.(%)**	**IgM (+) No.(%)**	**(-) No.(%)**	**Total No.(%)**
A	**18 36.0%**	**6 12.0%**	**26 52.0%**	**50 100.0%**	**A**	**20 36.4%**	**8 14.5%**	**27 49.1%**	**55 100.0%**
B	**7 23.3%**	**2 6.7%**	**21 70.0%**	**30 100.0%**	**B**	**8 22.2%**	**3 8.3%**	**25 69.4%**	**36 100.0%**
AB	**4 20.0%**	**2 10,0%**	**14 70.0%**	**20 100.0%**	**AB**	**5 20.0%**	**2 8.0%**	**18 72.0%**	**25 100.0%**
O	**15 37.5%**	**6 15.0%**	**19 47.5%**	**40 100.0%**	**O**	**17 38.6%**	**7 15.9 %**	**-**	**44 100.0%**
Total	**44 31.4%**	**16 11.4%**	**80 57.1%**	**140 100.0%**	**Total**	**50 31.3%**	**20 12.5%**	**90 56.3%**	**160 100.0%**

Cal.x2:5.67 Tab.x2.16.81 df:6 p=0.46, Cal.x2:8.30 Tabx2:16.81 df:6 p=0.21

Discussion

This research is the first to look into the prevalence of *Toxoplasma gondii* infection in the blood donors and applicants for marriage from Thi-Qar province ,Blood Donors :We used ELISA to test 140 blood donors and found no significant difference in infection rates between urban and rural residents (76.6% vs. 68.3% for IgG and IgM, respectively, These findings align with previous studies by Hamza, [10] and AL-Jubori, [11], who also reported no significant association between residence and Toxoplasma antibody presence.

For marriage applicants (n=160), the present study found no significant difference in IgG prevalence between urban (22.4%) and rural (25.3%) areas. This aligns with Jassam's, 2010 [12]. study on schizophrenic patients, which showed no significant difference in IgG prevalence based on residence.

While Igm among candidates for marriage in the rural region was (3%) higher than in Urban (2%) coincided with the study of Salibay et al. [13], in the Philippines, where They revealed that prevalence was higher in suburban patients than urban inhabitants. When Al-saadii was researched in males and females, it was found that 111 (91.73%) of the cases were in rural regions compared to 10 (8.16%) in urban areas [14]. The variation in the reading of *Toxoplasma*

gondii in a living environment may be caused by inadequate treatment, direct contact with cats and other animals as they give birth to animals in home parks, and a lack of health education in certain rural areas. Another factor could be that living in a more crowded area increases the risk of infection during pregnancy and childbirth. conditions in urban areas [15] may differ from research conducted in rural and urban locations with regard to hygiene and sample sizes; also, people in rural areas may eat more prepared foods and frequent restaurants in metropolitan areas. It is also crucial to highlight in this study that the main mode of transmission in Iraq is induced by oocyst ingestion.

The current study's ELISA test-based infection percentage revealed that, among marriage-seeking applicants, males and women had seropositive rates of 24.2% and 75.0%, respectively, based on their gender. The results matched those of Al-Maamuri [16], who discovered that 76.8% of females and 82.43% of males were seropositive. While Saleh, [18], discovered 17.83% of females and 9.1% of males were seropositive, Mahmood et al. [17] identified 13.3% of males and 43.3% of females to be seropositive. However, compared to females (26.19%), men (31.26%) in Kirkuk City's study by Salman and Mustafa [19] showed a greater seropositive rate.

While ELISA-IgM findings were recorded, male values were 1.5% higher than female results (0.0%). was, and the current investigation supported a previous Walle et al. study.[20] was found to be 4.0% in men and 2.0% in women. The research conducted by Al-Ghargholi [21] revealed different results, with Toxoplasma seroprevalence of 52.3% in men and 50.3% in women (IgG and (IgM)). 5.6% of men and 18.7% of women, respectively. Male blood donors with chronic infections had an IgG level of 24.3%, which was greater than the 2.14% level for acute infections. This difference could be the result of either male or female applicants for marriage being exposed to the T. gondii infection depending on where they live or work, or it could be the result of different size specimens that were exclusively taken from male blood donors. with fem15.

Whereas the age group of (32–36) years old had the highest proportion of *Toxoplasma gondii* infection by ELISA for IgG in blood donors, with 75% In agreement with Abdulla et al. [22], who discovered that 35% of people in the age group (31–40) had IgG. The ELISA (IgG) examined candidates for marriage who were 42 years of age or older, with a prevalence of 33.3%. This is consistent with [18], who discovered that the prevalence was 30% in the 40–49 year age group, and [16], who discovered that the prevalence was 85.39% in the 41–50 year age group. This, however, was not the case for AI-mosawi [23], who reported different results, with Toxoplasma seroprevalence of 66.6% for IgG and 26.4% for IgM in individuals aged 25 to 29. 45 and higher IgM had years percentage of 26.4%, which was in line with both IgG IN in the 45+ age range. The findings confirms the 49.2% prevalence of both IgG and IgM in the 20–24 age range. While ELISA-IgM recorded inconsistent results, they were in agreement with the presence of the highest percentage of blood donors and marriage applicants in the age category of 22-26-26 years (5.6%) and 6.9%, respectively [14]. which has observed that 30% of the age group (18–25) and [18] of 19–29 years Was 10.8%, while Mahmood et al. [24] reported comparable results with Toxoplasma in individuals aged 18 to 25. Was 30% with IgM. The current findings may be related to the varying numbers of afflicted individuals in each group. Additionally, the individuals may be encountering toxoplasma Cat-related soil exposure during childhood has led to the accumulation of anti-Toxoplasma antibodies in humans at varying percentages, which can cause the chronic infection toxoplasmosis. et al. Saplding [25]. The variations in the specificity and sensitivity of the approach utilized to diagnose each host's

response could be the cause of these discrepancies between the preceding result and the present result. To the parasitic strain Jilin, Suzuki, Y, and k [26].

It is noteworthy that the current study found a relationship between the blood group system and toxoplasma infection, with samples tested by ELISA IgG with blood group AB+ 4 (20.0%) having the highest prevalence and samples of group O+ 15 (37.5%) having the lowest prevalence. This relationship was significant (p-value = 0.46).However, the ELISA IgM antibodies test revealed that the blood group had the lowest proportion of toxoplasma (10.0%) and the highest percentage of toxoplasma (75.3%).According to a study conducted in Russia among blood donors, the seroprevalence of toxoplasmosis was twice as high in subjects with blood group AB than in subjects with blood group O (54% versus 27%, respectively) Henery, [27]. Nevertheless, Al-Kaysi and Ali concur on this outcome [28]. They demonstrated that

For the O+ and AB blood groups, toxoplasma infection was more preventable, with seropre valences of 35.8% and 38%, respectively. Percentage of infection by ELISA test: The current study's results are broken down by blood group, with the blood group AB+ 5 applicants having the highest prevalence of IgG infection (20.0%) and the blood group O+ 17 applicants having the lowest prevalence (38.6%), with a significant difference between the two (p-value:0.21).However, the ELISA IgM antibodies test revealed that the blood group had the lowest percentage of 6 (15.0%) and the highest percentage of 2 (10.0%) of toxoplasma. The presence or lack of the A and B carbohydrate antigens on the surface of red blood cells determines the A, B, and O blood group system Hakomori, [29]. Their findings are contradicting findings from four investigations that link this parasite to the Band AB blood group [30].

Conclusion

Infection frequency was in males then females for blood donors and higher females than males for applicants for marriage in all age groups and blood donors. Generally, people over 36 old are more vulnerable to infection.

Declarations

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Department of Biology, College of Science, University of Thi-Qar (Dec 2022/No. 201).

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Conflicts of interesting

All authors declared no any conflict of interesting

Disclosure

None

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