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Relationship Between *Toxoplasma Gondii* Infection and Blood Groups in Pregnant Women in Wasit Governorate

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Abstract

Toxoplasma gondii is an obligate intracellular parasite that infects most warm-blooded animals, including humans. Toxoplasmosis is a significant health concern, as infection during pregnancy can lead to serious health complications for the fetus. In this study, 300 blood samples were collected from pregnant women. ELISA testing revealed that 25 samples (8.3%) were positive for the parasite. The samples were categorized according to the ABO blood group system, and statistical analysis showed no significant association between blood type and toxoplasmosis infection. This suggests that an individual's blood type does not influence their susceptibility to *Toxoplasma gondii* infection. The study recommends routine screening for latent infections either before planning a pregnancy or during pregnancy to facilitate early diagnosis and ensure access to appropriate treatment.

Keywords: - Parasites, *Toxoplasma gondii,* Blood Groups**.**

1. Introduction

The parasite Toxoplasma gondii is an obligate intracellular parasite that infects warm-blooded animals, including humans. Studies indicate that approximately one-third of the global population is infected with this parasite, and the clinical outcome is strongly linked to the strength of the individual's immune response in dealing with it, A life cycle of *Toxoplasma gondii* is completed in the last host, the excrement of infected cats. Humans are infected mainly by contact with this excrement. Other sources of the disease are eating

contaminated meat and drinking unpasteurized milk [1].

T. gondii was a parasite establish in every country and climate. It can survive in multiple vertebrate hosts. Humans, other animals, birds and rodents served as intermediate hosts. Cats and other felids were the final hosts [2].

The infection remains latent until the host immune system is activated. Tissue cysts burst and the latent parasite multiplies quickly [3]. The virulence of T. gondii depends on factors associated with the host's immune response or to communication between the parasite and host cell [4].

In some countries, such as France and Austria, the parasite *Toxoplasma gondii* was viewed as a commensal organism—one that does not cause clinical symptoms upon infection, except during pregnancy. The interest in toxoplasmosis increased along with the AIDS and with the concept of " "opportunistic pathogen." player in which was T. gondii. The finding of the beginning of the 21st century of strains of T. gondii, which are able to kill healthy people in isolated tropical areas transformed the way we see the parasite [5].

The immune status, genetic background and host type of the host also impact the course of the disease after infection with *T. gondii*. Some species tend to resistant to *Toxoplasma gondii* infection whereas others are highly susceptible, as they are in habitats close to the final hosts of the parasite [6].

Severe infection with this parasite and the problems it causes during pregnancy still occur frequently around the world, although preventative steps have been made [7]. How the parasite spreads eating undercooked meat, contaminated food, or contaminated water. The disease, which can lead to blindness and hearing loss, or retardation of mental and motor development, convulsions, blood abnormalities, enlargement of the liver and spleen, or death, is almost always transmitted to the fetus from pregnant women who have the primary infection [8].

Since toxoplasmosis is rarely cured due to the difficulty of eliminating latent tissue cysts, serological screening and public awareness campaigns currently represent the best available options for prevention in children, or for early detection and the administration of appropriate treatment. Clinical results

have shown a positive response when both the pregnant mother and the newborn receive treatment for the infection during the child's first year of life. [9].

Nearly all endothermic species, plus humans, can be infected by intracellular *Toxoplasma gondii*. There was no significant statistical difference between toxoplasmosis infection and interaction with animals. Only blood type was associated with disease caused by *T. gondii.* correlation was considered significant at .05 level. It is better to obey this important aspect of society so as to have healthy offspring capable of building the nation. The mean levels of AST, ALT and ALP were lower in the toxoplasmosis patient's serum but not significantly. These results may provide better understanding of toxoplasmosis pathogenesis [10].

The infection remains latent until the host's immune system is compromised at which point tissue cysts rupture, releasing the dormant parasite which rapidly multiplies [11].

2. Materials and Methods

2.1. Sample Collection

This study was carried out in AL-Kut Hospital, Wasit Province from December 2024 to May 2025. Blood samples were taken from 300 pregnant women who came to the hospital and some information was noted (age, weight, family history and residence). The age range was 17-35 and the weight 50-95.

2.2. Blood Groups

ABO blood grouping was carried out using a commercial blood grouping kit. Anti-A and anti-B slide agglutination test was performed using monoclonal antisera (anti-A and anti-B; Atlas Medical, UK) as per the manufacturer's instructions. Samples giving visible agglutination with respective antisera were recorded as positive and absence of agglutination was considered as negative reaction.

2.3. ELISA Test

All obtained sera were tested for anti-Gondii IgG and IgM antibodies using a commercial ELISA kit (ACON Biotech, Hangzhou, China) as per the manufacturer's instructions. Both IgG and IgM values were normalized to. IgG and IgM were classified as being in an indeterminate range between 0.9 and 1.1 IU/mL, a positive index value >1.1 IU/mL and a negative index value <0.9 IU/mL.

2.4. Statistical Analysis

The relationship between serological status for *Toxoplasma gondii* antibodies ABO blood groups and was assessed using the chi-square (χ ^2) test. Based on observed and expected frequencies calculated from the study sample (N=300).

4. Results and Discussion

The observed seroprevalence rates of *T. gondii* infection differed between blood group categories. The lowest rates were observed in blood groups B and AB at 6.67% while the highest rate was detected among individuals with blood group O at 9.57%.

However, the chi-square test showed that these differences are not statistically significant though there are obvious differences in seroprevalence among the blood groups as shown in table (1), and this result is represented in diagram (1)

Table 1: Relationship between blood groups and *Toxoplasma gondii*

Blood groups	Positive cases	Negative cases	Chi-square	P value
A	8 (8.42%)	87	0.557	0.906
B	4 (6.67%)	56		
O	11(9.57%)	104		
AB	2(6.67%)	28		
TOTAL	25 (8.3%)	275		

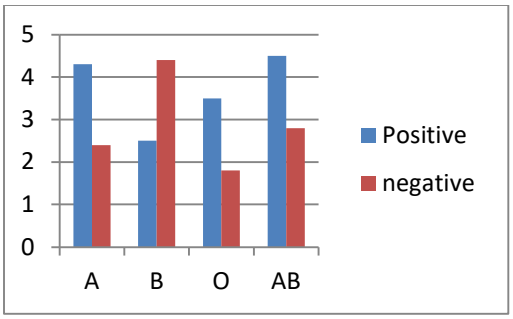


Figure1: - Illustrate positive and negative toxoplasmosis cases in ABO groups.

Chi square value was 0.557. The corresponding p-value for 3 degrees of freedom was 0.906. This p-value is much larger than the usual alpha level of 0.05 Consequently, it is not possible to reject the null hypothesis, which states that there is no correlation. The results of this analysis, which show no association of ABO blood groups with *Toxoplasma gondii* infection, are remarkably consistent with the prevailing consensus in the global scientific literature. Several large studies have not found a clear association.

A major cross-sectional study of [12] 2,053 people reported similar seroprevalence rates across ABO groups: 8.5% in group A, 4.3% in group B, 4.7% in group AB and 8.9% in group O. They obtained a p-value of 0.19 and concluded that *Toxoplasma gondii* infection is not associated with ABO blood groups. This conclusion is also supported by a large

systematic review and meta-analysis from [13] with 21 studies and 10,910 people in total that found no statistically significant pooled odds ratio.

The study concluded that the meta-analysis did not discover any link between the prevalence *of T. gondii* infection and ABO blood groups. This is some of the best evidence available from a synthesis of many studies, most of the evidence points to no association, although it is important to note that there is some conflicting evidence in the literature, one study in Wasit Province, Iraq, showed a possible association of blood group O with improved susceptibility to *T. gondii* infection. But these reports are rare and usually involve smaller study groups or particular groups of people [13].

The vast majority of large, well-designed studies and meta-analyses almost unanimously conclude that ABO and Rh blood groups do not play a major role in susceptibility to *T. gondii* infection [12].

Other studies showed a correlation between certain blood types and the presence of toxoplasmosis infection in contrast to the current study. Some studies found a relation between blood group and the positive cases. Blood group B had the highest percentage of 43.75% followed by group A with 25%. Thus, the individual with blood group B may have a higher chance of getting infection [1].

Al-Mosawi in a study for students of Thi-Qar University found relationship between blood group and Toxoplasmosis, the lowest prevalence was in blood group B (17.44%) and the highest prevalence among blood group A (30.65%) [14].

Limitations of this study include the relatively limited sample size (N = 300) and very limited number of seropositive cases (n = 25) which limit power to detect subtle associations.

The study was also performed in one area and the results can't be generalized, the absence of other important confounders such as age, sex, socioeconomic factors, diet, cat ownership and hygiene habits also border our interpretation.

Finally, the dataset did not differentiate between IgG and IgM. This prevented the understanding of potential differences between past exposure and recent infection.

5. Conclusion

The statistical analysis of the data in this study revealed no statistically significant association between toxoplasmosis infection and blood types. These findings are consistent with several previous international studies, including meta-analyses and large-scale cross-sectional studies. The results suggest that susceptibility to toxoplasmosis is not linked to blood type; therefore, future research should focus on investigating the environmental and behavioral factors that predispose individuals to infection, as well as developing methods to address them.

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