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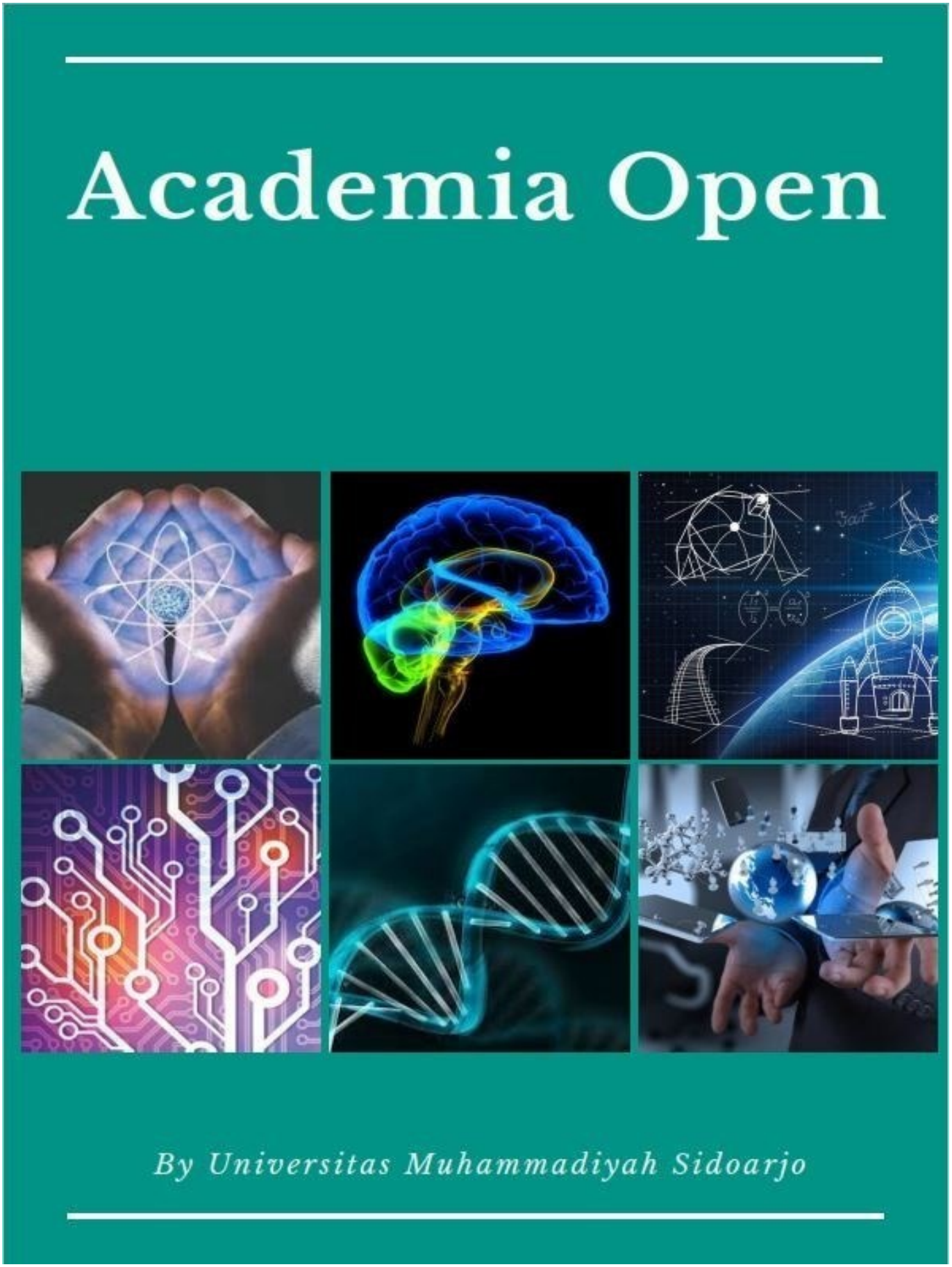

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Serological Detection of Toxoplasmosis in Relation to marital status, Cats Contact and Abortion in Wasit province, Iraq

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Abstract

General Background: Toxoplasma gondii represents a globally distributed protozoan parasite capable of infecting warm-blooded animals, including humans, with particular concern for pregnant women due to risks of miscarriage and congenital malformations. **Specific Background:** While toxoplasmosis has been extensively investigated worldwide, limited epidemiological data exist regarding its prevalence and associated risk factors among women in Wasit Province, Iraq. **Knowledge Gap:** The relationship between T. gondii seropositivity and socio-demographic factors such as marital status, cat contact, and abortion history remains inadequately characterized in this region. **Aims:** This study aimed to determine the seroprevalence of T. gondii antibodies (IgG and IgM) among women of reproductive age and examine associations with marital status, cat contact, and abortion history. **Results:** Among 300 women tested, 51% demonstrated seropositivity for T. gondii antibodies, with significantly higher rates observed in married women (54% vs. 30%, p=0.05) and those with abortion history (69% vs. 42%, p=0.05). **Novelty:** This study provides the first comprehensive assessment of toxoplasmosis seroprevalence and risk factors specifically among women in Wasit Province. **Implications:** These findings underscore the necessity for targeted public health interventions, including periodic screening of reproductive-age women, health education on food hygiene and cat interactions, and environmental preventive strategies to reduce T. gondii transmission.

Highlight :

- The study found 51% seroprevalence of T. gondii antibodies among women in Wasit Province, Iraq, indicating a significant public health concern.
- Married women showed higher seropositivity (54%) than unmarried women (30%), linked to household exposure and contaminated food handling.
- Women with abortion history had elevated seroprevalence (69%), highlighting the need for routine toxoplasmosis screening in prenatal care..

Keywords : Toxoplasma gondii, Seroprevalence, Reproductive Health, ELISA Diagnostic, Zoonotic Infection

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Introduction

Toxoplasma gondii is a typical obligatory intracellular protozoan parasite that has an extremely wide host range that includes humans. It gives rise to toxoplasmosis as a zoonotic infection with huge global health significance due to its prevalence, various transmission modes and potential of serious complications among immunocompromised individuals and pregnant mothers [1][2]. The definitive hosts are the domestic and wild cats (Felids) which release environmentally resistant oocysts in feces that contaminate soil, water and sources of food [3]. These oocysts possess a prolonged life cycle and can survive longer in favourable climatic factors up to a year long, a long term source of human infection [4][5]. The life cycle of T. gondii is complex that requires sexual reproduction in felid and asexual reproduction in intermediate hosts such as human beings and other mammals. The release of tachyzoites is accompanied by the ingestion of infectious oocysts or tissue cysts and infects the host cells spreading throughout the body. The clinical manifestations are not always pronounced and may be asymptomatic or mild, as they are easily overcome by immunocompromised people. Other patients who are at risk and include HIV/AIDS or immunosuppressive therapy are prone to acute neurological disease, including encephalitis, seizures, and multiple organ involvement [6][7]. The toxoplasmosis level of seroprevalence is quite non-uniform throughout the world, depending on the climatic, cultural, dietary and economic factors. Some of the East Asian populations have reported seroprevalence as low as 7% in comparison with prevalence of more than 70% in parts of Latin America, Europe and the Middle East [8][9]. The main elements of exposure risk are the environmental contamination, hygiene, dietary habits and socioeconomic status [10][11]. The seroprevalence reported in women of reproductive age in Iraq is ranging between 30-70 percent thus proving the need of the local epidemiological information [12][13]. Human beings are the primary users of T. gondii by ingesting an oocyst in contaminated soil, water, fruits, vegetables or direct contact with cat feces [14]. The other important pathway is by the intake of tissue cysts in under-cooked or uncooked meat, especially lamb, goat or pork [15]. The infection of mother to fetus can lead to the congenital toxoplasmosis which is linked with the miscarriage, still birth or severe birth defect of the central nervous system and eyes [16][17]. The infection may also occur because of blood transfusion or organ transplantation which is not common [18]. Prevention schemes presuppose awareness of the transmission paths. The clinical manifestations of toxoplasmosis are the most different. The infection can occur among immunocompetent adults without symptoms or with mild symptoms such as fever, lymphadenopathy or malaise. Periconceptual infection is extremely dangerous to the fetus and some of its effects include spontaneous abortions, hydrocephalus, chorioretinitis, intracranial calcifications, and delayed neurodevelopment in the long term [19][20] among others. The immunocompromised may experience toxicoplasmic encephalitis or multiorgan involvement which are life-threatening complications [21]. Serological diagnosis is the most significant method of T. gondii infection diagnosis. IgM antibodies depict recent or acute infection and IgG antibodies depict past exposure and acquired immunity [22]. ELISA is a highly sensitive, specific and has many samples per run [23]. Molecular diagnosis has been applied more and more in order to identify the infection status and differentiates acute and chronic infections, in particular in pregnant women [24][25]. The epidemiological data of Iraq is limited, and the environmental factors such as dry climate, massive agricultural activities, and the great number of stray cats contribute to further pollution of the environment [26]. This is particularly vulnerable to the fertility age group because the primary infection during pregnancy may have disastrous impacts on the unborn baby [27]. Previously, a correlation was observed between T. gondii seropositivity and age, marital status, diet, contact with cats, history of abortion in Iraq and the other neighboring countries [28][29]. The population of interest of the proposed research is a sample of women visiting Al-Zahraa and Al-Karamah Teaching Hospitals in the Wasit Province, Iraq to determine the seroprevalence of T. gondii IgG and IgM antibodies and how they correlate with the demographic and behavioral risk factors, including marital status, cat contact, and history of abortion. The study will facilitate the delivery of the latest information on the epidemiology at the local scale besides assisting to identify the high-risk populations requiring certain interventions [30]. The public health strategies that will assist in the reduction of the rates of the infections include community health education, frequent screening and improved hygiene practices. The early diagnosis and prevention of congenital toxoplasmosis and adverse prognosis of reproduction can result in early medical intervention. It is recommended that there should be education about proper food handling, under-cooked meat consumption, cat feces disposal and environmental hygiene [31][32]. The exposure risk may be minimized further by controlling the population of stray cats as well as monitoring the environmental pollution. One of the examples of the One Health issue is toxoplasmosis that indicates how human behaviors, animal reservoirs, and the environment interact. The exposure-risk factor dynamics that are also modifiable are significant in the development of the holistic approach of preventing human and animal health using the public health strategies [33]. Recent discoveries have also demonstrated that the variations of strains and pathogenicity is more geographically varied and therefore there is a need to undertake localized surveillance in order to institute clinical management and preventive action [34]. The current project is an elaborated analysis of T. gondii seroprevalence in female in Wasit Province, Iraq and the factors to be taken into consideration as the determinants of infection. The evidence will assist in informing the health related work of the population, the clinical activity and the community education to reduce the burden of toxoplasmosis and prevent adverse pregnancy outcomes [35]. The following was the objective of the study being undertaken: To determine seroprevalence of T. gondii, IgG and IgM in the Wasit Province of women using ELISA. Infection and marital status search relations. Establish the risk factor of direct or indirect contact with cats to be infected. Create a connection between the history of abortion and seropositivity.

Materials and Methods

A. Study Area

The fieldwork was conducted within the Wasit Province, which is the eastern part of Iraq, and has both the urban as well as the rural population. The recruitment areas were selected as the two tertiary hospitals of Al-Zahraa and Al-Karamah Teaching Hospitals because of the high number of outpatients and demographic diversity.

B. Study Design and Population

The research is a cross sectional study that was conducted between January and July 2025. Three hundred of them were consecutive recruited women aged 18 to 45 who were outpatients of the clinics or diagnostic labs. The exclusion criteria involved the past occurrence of immunosuppressive diseases and the availability of anti-parasitic treatment.

C. Data Collection

Remote surveys were done to provide information that characterized age, dwelling, marital state, direct or indirect contact with cats, abortion history as well as diet. The informed consent was written out and all participants gave it.

D. Blood work and blood processing

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A centrifugation of 5ml venous blood rotating at 3,000 0 -1 centrifuge during 5minutes and kept at -20 C was carried out and serum analysed.

E. ELISA Testing

Antibody of T. gondii as IgG and IgM was determined by a commercial ELISA kit (EuroImmune, Germany) as per the instructions provided by the manufacturer. The procedure entailed dilution of serum, conjugation of enzyme, reaction with substrate and absorbance at 450 nm.

F. Statistical Analysis

The analysis of data was performed with the help of SPSS v25. Chi-square was used to test the association between categorical variables. Less significant P-values were considered significant and less than 0.05.

Result

A. Overall Seroprevalence

Out of 300 women tested, 152 (51%) were positive for *T. gondii* IgG and/or IgM antibodies.

B. Seroprevalence by Marital Status

A significantly higher prevalence occurred among married women (Table 1).

Table 1. Prevalence of Toxoplasmosis by Marital Status

Marital Status	Total Women	IgM Positive	IgM %	IgG Positive	IgG %	Total Positive	Prevalence (%)
Unmarried	37	6	16%	5	14%	11	30%
Married	263	63	24%	67	25%	141	54%
Total	**300**	**69**	**23%**	**72**	**24%**	**152**	**51%**

p-value: 0.05 (Significant)

C. Seroprevalence by Cat Contact

Women reporting cat contact either owning cats or environmental exposure showed higher seropositivity (Table 2).

Table 2. Prevalence of Toxoplasmosis by Cat Contact

Cat Contact Status	Total Women	IgM Positive	IgM %	IgG Positive	IgG %	Total Positive	Prevalence (%)
Contact	159	41	26%	44	28%	92	57%
No Contact	141	28	20%	29	20%	60	43%
Total	**300**	**69**	**23%**	**73**	**24%**	**152**	**51%**

p-value: 0.30 (Not Significant)

D. Seroprevalence by Abortion History

Women with a history of abortion had significantly higher seropositivity rates (Table 3).

Table 3. Prevalence of Toxoplasmosis by Abortion History

Abortion History	Total Women	IgM Positive	IgM %	IgG Positive	IgG %	Total Positive	Prevalence (%)
Abortion	96	29	30%	27	28%	66	69%
No Abortion	204	40	20%	45	22%	86	42%
Total	**300**	**69**	**23%**	**72**	**24%**	**152**	**51%**

p-value: 0.05 (Significant)

Discussion

The analyzed article (researched Toxoplasma gondii seroprevalence of women in Wasit Province, Iraq and the dependence between this prevalence and marital status, contact with cats and abortion history). A board level of 51 percent of seroprevalence demonstrates that toxoplasmosis remains among the areas of concern of health status of the population.

A. Data analysis on the national and international levels.

It is common as any other past research that has been carried out in Iraq as a study in Kufa and Wasit that found out seroprevalence of 40-60 percent. The neighboring countries including Saudi Arabia and Egypt have registered the same rates. Even the prevalence is not evenly spread in the world as the lowest prevalence is seen in East Asia with certain parts of Latin America and Europe having the prevalence exceeding 70 percent.

B.Risk Infection and Marital status.

The proportion of (54%), who were compared to the number of infected unmarried women (30 percent), was found to be infected married women. The results are in agreement with the former research in Egypt, Iran and Saudi Arabia. Its occurrence could be due to exposure to domestic activities and responsibilities like food preparation, raw meat handling and storage, and domestic animal care; age, and exposures; There is an environmental exposure at the rural family that overlaps the farming activities in the family.

C. Cat Contact as a Risk Factor

Though the statistical significance of the number of cat contacts in the study (30 = -0.30) was not achieved, it was greater among women who had contacts with cats (57%). The only sure host that can shed the oocysts is the categories of cats and an infected cat that can shed 20 million oocytes. The results of other studies are incongruent; this is because some researchers demonstrate the fact of existence of significant correlations and others fail to demonstrate clear correlation. The reason behind such disparity might be linked to the extent of environmental pollution, how to be healthy or even the extent of personal contact.

D. Correlation analysis between infection and abortion is known to be very correlated with the existence of infection (P = 4.4).

They noted that the adoption history was positively correlated with seroprevalence (p = 0.05). Women who had undergone an abortion already were very seropositive (69%). This is in line with the findings of the research that have been hypothesized in Iraq, India, the Middle East and South America which indicate that reproductive complications are positively correlated with T. gondii infection occurrence. It has been mentioned that acutely infected toxoplasmosis-induced premature pregnancies have been reported to lead to: spontaneous abortion, malshapen baby, irreversible brain damage in the unborn baby, stillbirth. In that regard, the T. gondii antibody screening would become one of the constantly applied measures of women with recurring pregnancies losses.

E. Public Health Implications

The results justify the determinants that are high-risk and need to be addressed using interventions: Food safety, cat hygiene and soil exposure health education. Repeated screening of pregnant women with T. gondii IgG and IgM. Hygiene education on the dangers of under cooked meat. Environ: Stray cats to reduce oocyte contamination...

Conclusion

As has been established in this paper, Toxoplasma gondii infection has been a significant problem in the Wasit Province of Iraq and the resultant seroprevalence rates 51 percent in all women. The findings suggest that demographic, behavioral and reproductive factors are extremely critical in the risk of infections. Married women also had higher seropositivity than the non-married one which could have been due to the increased number of household chores, more contact with infected food or soil and contact with household animals. The seropositivity of women who had direct/indirect contact with cats was higher which proved the significance of felids in being endemic hosts and the role of environmental contamination by oocysts to the transmission process. Interestingly, the seroprevalence level was much greater among women with an abortion in the past, which proves that the issue of the role of toxoplasmosis in the development of adverse reproductive outcomes has an opportunity.

These results point out the need to screen and detect early and often and prevention procedures in minimizing the exposure of infections in the reproductive age women. Health education should be provided in terms of safe food handling and proper hygiene contact with cats or infected soil, and undercooked meat. Moreover, the toxoplasmosis diagnosis should be introduced into the program of prenatal care routine to avoid maternal and congenital infection by means of including it into the program of the official health authorities work.

Recommendations

Using the results of the current research, it is possible to suggest some interventions in the area of public health to avoid the high incidence of Toxoplasma gondii infection in women of Wasit Province. The screening of IgG and IgM in the blood of women of reproductive age and women undergoing preconception and early pregnancy should be done on a regular basis to ensure that the infection is detected at an earlier stage and thus dealt with. The community based health education would be formulated to sensitize on the safe food handling, the risks of undercooked meat, good hygienic habits of cat handling, and environmental factors of oocyst contamination. There should be the adoption of the environmental manipulation such as nodding the number of stray cats, and testing the soil and water to identify whether they are contaminated to improve on exposure minimization. Besides, the toxoplasmosis testing and education among pregnant women program must be integrated with prenatal services to eliminate the negative effects of pregnancy (miscarriage, stillbirth, and malformed babies, etc.). Lastly, additional studies with larger and more representative populations and the help of complementary diagnostic instruments will be able to increase the knowledge about the local epidemiology as soon as possible, thus, the analysis of risk-factors will be narrowed down, and the specific intervention will be offered to make disease prevention and control more effective

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