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Research Article

Association between Risk Factors and Seroprevalence of Toxoplasmosis among Women of Reproductive Age

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Abstract:

Background: Toxoplasmosis being one of the most neglected tropical parasitic infections is gaining much prominence economically, medically and epidemiologically. There are concerns that certain human conduct can predispose them to this infection. The study was aimed at determining the association between selected risk factors and seroprevalence of toxoplasmosis among women of reproductive age using ELISA technique in Port Harcourt. This was a descriptive cross-sectional study of 450 women of reproductive age. They were categorized into 4 groups namely; HIV patients (HP), Pregnant women (PTW), Outpatients (OP) and Healthy controls (HC). The HP group was 150 while the other groups had 100 participants each. Participants were randomly selected and written consent was obtained from them prior participating in the study. A well-structured questionnaire was developed to obtained data on risk data assessment such as "knowledge of infection", "wash fruit", "treat water", "own a pet" and "consume suya". Blood samples were collected and assayed for IgM and IgG *toxoplasma* antibodies using ELISA technique after ethical clearance and informed/written consent were obtained. Socio-demographic data (age, occupation and educational status). There was a significant ($p<0.05$) distribution of toxoplasmosis in IgM and IgG antibodies among the four studied groups (HP, PTW, OP and HC). There was no significant ($p>0.05$) association between "knowledge of infection" and seroprevalence of toxoplasmosis in both IgM and IgG. There was a significant ($p<0.05$) association between "wash fruit" and seroprevalence of toxoplasmosis in both IgM and IgG. There was no significant ($p>0.05$) association between "treat water" and seroprevalence of toxoplasmosis in both IgM and IgG. There was no significant ($p>0.05$) association between "own a pet" and seroprevalence of toxoplasmosis in both IgM and IgG. There was no significant ($p>0.05$) association between "consume suya" and seroprevalence of toxoplasmosis in both IgM and IgG. The study has revealed that attitude of women of reproductive age over fruit washing before eating has a strong link with *Toxoplasma gondii* infection among women in the groups studied.

Keywords: toxoplasmosis, seroprevalence, risk factors.

1. Introduction

According to Dubey and Jones, (2008), toxoplasmosis is a significant yet underappreciated tropical parasite infection with a wide geographic range. *Toxoplasma gondii*, a protozoon, is the culprit (Schuler, 2014). *Toxoplasma* spp. infections are thought to affect about one-third of all people on earth (Onosakponome et al., 2020). Toxoplasmosis is categorized as one of the neglected tropical illnesses by the Centres for Disease Control and Prevention (CDC) (Onosakponome et al., 2020). According to numerous studies, cats and other feline species are the only animals that expel the oocysts into the environment, making them the clear host. This acknowledges the fact that living with cats increases your risk of contracting the disease. Direct infection from handling cats is thought to be quite uncommon, nevertheless (Mustafa et al., 2019). Some animals, including humans, can act as intermediate hosts, allowing the parasite to infiltrate the body systemically and generate tissue cysts. Ingestion of raw or partially cooked meat, particularly hog, lamb, or venison containing toxoplasma cysts, can also result in transmission. Oocysts can also be consumed by eating oocysts that cats have shed into the environment or by using knives, utensils, or cutting boards that have been contaminated with raw meat (Mustafa et al., 2019). Additionally, *Toxoplasma* spp. could spread through organ transplantation or transplacental methods. *Toxoplasma* spp. infections typically cause no symptoms in people with healthy immune systems. In contrast, toxoplasmosis can have substantial pathological and congenital unfavourable effects in people who are immunocompromised or pregnant (Avelino, 2014). During pregnancy, toxoplasmosis poses a serious and even fatal risk, particularly to the developing foetus and newborn children. Chorioretinitis is one of the late signs of congenital toxoplasmosis (Avelino, 2014). According to Alvarado et al. (2014), vertical transmission can result in mental impairment, blindness, epilepsy, and even death. Toxoplasmosis can cause severe encephalitis in immunocompromised patients and be life-threatening due to acute infections or reactivation of latent infections. The locations and weather where the parasite persist in the environment determine the disease's geographic dispersion. According to estimates, the parasite is present in between 30% and 65% of all nations (Mustafa, 2019). According to Geleye (2015), human toxoplasmosis is prevalent in Sub-Saharan Africa with a seroprevalence of 3.6–84% in various nations. Environmental and socio- cultural factors are to blame for the variance in prevalence rates. Geleye (2015) reported high prevalence rates of 74.7% in Ethiopia, 66.6% in the Central African Republic, and 59.4% in the Republic of Congo. Seroprevalence levels of 32%, 23.9%, and 22.2%, respectively, have been recorded in Nigeria's Zaria, Maiduguri, and Abuja (Imam, 2016). However, there is little research on toxoplasmosis in schizophrenia, a growing worldwide health concern, in the Niger-Delta region, particularly in Port Harcourt.

Toxoplasma gondii infection transmission and acquisition have been linked to a number of risk factors. These include consuming contaminated food or water, coming

into contact with diseased animals, and practicing inadequate hygiene. There is, however, no data on the relationship between these risk variables and the frequency of *Toxoplasma gondii* infection among women in Nigeria who are of reproductive age. Ethiopia was reported to have high incidence rates of 74.7% (Geleye, 2015).

The purpose of this study is to ascertain whether certain risk factors are related to the seroprevalence of toxoplasmosis among women in Port Harcourt, Nigeria. In addition to other risk factors, the study will evaluate knowledge of the infection, cleanliness habits, and pet ownership.

2. Materials and Methods

2.1. Study Area

The Rivers State University Teaching Hospital (RSUTH) formerly known as Braithwaite Memorial Specialist Hospital (BMSH) served as the site of this study. Within latitudes 4º78 N and 7º01 E, RSUTH can be found. As a Tertiary Health Faculty, the hospital accepts referrals from both public and private institutions in Port Harcourt and the surrounding area. This study was carried out between January 2022 to June 2022. Women of reproductive age, including HIV, outpatients, pregnant women attending antenatal clinics (ANC), and non-pregnant women, participated in a descriptive cross-sectional study. The age range of the participants are between 15 and 55 years old.

2.2. Sample Size and Collection

The sample size was calculated using the overall seroprevalence of the study conducted in Nigeria by Deji-Agboola et al. (2011), which was 40.2%. As a result, the minimum sample size at the 95% confidence interval was 369, which was rounded up to 400. Venipuncture was used to get venous blood while adhering to all aseptic procedures. Three to four millilitres of blood were quickly drawn and placed into a dry tube withthe appropriate label. For samples that were processed two to seven days following the date of collection, the samples were moved to the lab and centrifuged at 3000 rpm for five minutes to separate the serum from the red blood cells. The samples, developing plate cards, and reagents were heated to 24ºC after being given time to thaw out. The samples were examined using Bio Check for IgM and IgG enzyme, an immunoassay test kit specifically designed to detect toxoplasma immunoglobulins which Montayaet al. (2008) detailed in great depth.

2.3. Eligibility Criteria

Eligibility for this study was determined using some inclusion and exclusion criteria which are stated below.

Inclusion Criteria

All healthy controls who tested negative for HIV and pregnancy were included, as were all HIV female patients who tested negative for pregnancy. Participants between

the ages of 15 and 55 were also included, as were individuals who were part of thestudy population. The study only included subjects who provided informed, written consent.

Exclusion Criteria

All participants who provided informed or written consent but were later determinedby preliminary tests to be ineligible for the study were also excluded, as were those who were not between the ages of 15 and 55 or who did not belong to the study population.

2.4. Ethical Consideration and Informed Consent

All study participants provided verbal or written informed permission, and the Rivers State University Teaching Hospital and Rivers State Ministry of Health Ethics Committees granted their approval. After confirming that they complied with the requirements that qualified them for inclusion, subjects were chosen at random from the Rivers State University Teaching Hospital.

2.5. Data Analysis

Before entering the data into Microsoft Excel, the data collection forms were checked for completeness, obvious errors, and inconsistencies. All statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) Version 25, California Inc., USA; a p-value of less than 0.05 was regarded as significant. To evaluate the relationship between the investigated risk variables and toxoplasmosis, the chi-square analysis was utilized.

3. Results

Table 1. Overall Sero Prevalence of Toxoplasmosis Among Four Sub Groups

Sub Group	Number Examined (%)		Number Positive (%)		x^2		P Value	
	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG
Hp	150	150	76(50.7)	72(48.0)	150.000		0.462	
Ptw	100	100	23(23.0)	36(36.0)				
Op	100	100	33 (33.0)	40(40.0)				
Hc	100	100	30(30.0)	58(58.0)				
Overall	450	450	162(36.0)	206(45.8)	22.953	11.520	0.000	0.009

Table 2. Seroprevalence of Toxoplasmosis Among the Study Subjects Based on Risk Factors

Risk Factors	Responses	Number Examined(%)	Number Positive(%)										
KNOWLEDGE OF			HP		PTW		OP		HC		x 2		p value	
			IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG
INFECTION	Yes	22	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (9.0)	2 (9.0)	6 (27.0)	2 (9.0)	0.001	0.001	0.971	0.971
	No	428	76 (17.8)	72 (16.8)	23 (5.3)	36 (8.4)	31 (7.2)	37 (8.6)	24 (5.6)	52 (12.1)				
WASH FRUITS														
	Regularly	425	68 (16.0)	63 (14.8)	23 (5.4)	36 (8.5)	26 (6.1)	33 (7.8)	30 (7.1)	58 (13.6)				
	Occasionally	21	5 (23.8)	6 (28.6)	0 (0.0)	0 (0.0)	7 (33.3)	7 (33.3)	0 (0.0)	0 (0.0)	7.083	7.083	0.029	0.029
	Rarely	4	3 (75.0)	3 (75.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)				
TREAT WATER														
	Regularly	7	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (28.6)	2 (28.6)	0 (0.0)	0 (0.0)	1.512	1.512	0.469	0.469
	Occasionally	58	5 (8.6)	4 (6.9)	1 (1.7)	1 (1.7)	9 (15.5)	12 (20.7)	2 (3.4)	8 (13.8)				
	Rarely	385	71 (18.4)	68 (17.6)	22 (5.7)	35 (9.0)	22 (5.7)	26 (6.8)	28 (7.3)	48 (12.5)				
OWNS A PET	Yes	10	0 (0.0)	0 (0.0)	0 (0.0)	3 (30.0)	3 (3.0)	3 (3.0)	0 (0.0)	0 (0.0)	1.392	3.945	0.468	0.346
	No	440	76 (17.3)	72 (16.4)	23 (5.2)	33 (7.5)	30 (6.8)	37 (8.4)	30 (6.8)	58 (13.2)				
CONSUME SUYA	Yes	426	70 (16.4)	66 (15.5)	22 (5.2)	35 (8.2)	31 (7.3)	36 (8.5)	30 (7.0)	58 (13.6)	1.794	1.794	0.408	0.408
	No	24	6 (25)	6 (25.0)	1 (4.2)	1 (4.2)	2 (8.3)	4 (16.7)	0 (0.0)	0 (0.0)				

***Abbreviations**: IgG, Immunoglobulin G; IgM, Immunoglobulin M; HP, HIV Patients; PTW, Pregnant Women; OP, Outpatient; HC, Healthy control, Df = Degree of freedom, X^2 = chi square value , P = probability.* *Distribution of*

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toxoplasmosis was statistically significant ($p<0.05$). Distribution of toxoplasmosis was not statistically significant ($p>0.05$)

4. Discussion

In Port Harcourt, Nigeria, women of reproductive age were studied to see if there was any correlation between a few risk variables and the seroprevalence of toxoplasmosis among them. Our findings showed that IgM and IgG antibodies to toxoplasmosis were significantly distributed throughout the four study groups (HP, PTW, OP, and HC), with the HP group having the greatest seroprevalence. This conclusion is in line with earlier research that showed a greater prevalence of toxoplasmosis among HIV-positive people and pregnant women (Alvarado-Esquivel et al., 2016). However, there was some variation in the seroprevalence of toxoplasmosis in HIV-positive individuals in other studies, with 22.2% and 27% reported in Eastern Nigeria, Abuja, Nigeria, and Sudan, respectively (Ogoina et al., 2013) and Sudan (Mustafa et al., 2019), while other studies reported lower seroprevalence rates of 36.0% (Onosakponome, et al., 2020),

40.8% various disparities could be the result of lifestyle choices, geographic location, weather patterns, and prevailing socio-demographic characteristics that contributed to the spread of the parasite in various areas.

It's interesting that neither the "knowledge of infection" nor the seroprevalence of toxoplasmosis in IgM or IgG were significantly correlated in this study. This finding contrasts with some earlier research that found a connection between seroprevalence and knowledge of toxoplasmosis (Khamesipour et al., 2018; Alvarado-Esquivel et al., 2014). It's probable that the increasing health education campaigns on toxoplasmosis in recent years contributed to the relatively high degree of knowledge of the infection among our research sample.

However, this study discovered a substantial correlation between "wash fruit" and toxoplasmosis seroprevalence in both IgM and IgG. This finding is in line with some earlier research that found a toxoplasmosis risk factor for eating raw fruits and vegetables (Dubey & Jones, 2008; Marugan-Hernandez et al., 2014). By using polluted water for irrigation or manure contaminated with cat faeces, fruits and vegetables may become contaminated with Toxoplasma oocysts found in the soil. Therefore, it is crucial to wash and boil fruits and vegetables properly in order to prevent illness.

The seroprevalence of toxoplasmosis in both IgM and IgG was not significantly correlated with "treat water," "own a pet," or "consume suya" in this investigation. This result is in contrast to other earlier research (Alvarado-Esquivel et al., 2014; Jittapalapong et al., 2014; Ogbolu et al., 2015), which found a substantial connection between these risk factors and toxoplasmosis. It's likely that these risk variables were only lightly experienced by our study sample.

5. Conclusion

According to the study, there is a significant correlation between the attitudes of reproductive-age women towards cleaning fruit before eating and *Toxoplasma gondii* infection in the groups of women who were tested. Therefore, it is crucial to wash and boil fruits and vegetables properly in order to prevent illness. In order to lessen the burden of toxoplasmosis among women of reproductive age, health education programmes should also emphasize the significance of these preventative actions. Additional research is required to examine additional risk factors for toxoplasmosis in this population.

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