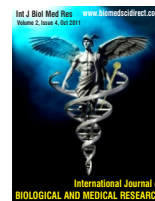




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### Original Article

# Seroprevalence of *Toxoplasma gondii* Antibodies among Pregnant Women Attending Antenatal Clinic of Federal Medical Center, Lagos, Nigeria.

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#### ABSTRACT

The mortality rate of *Toxoplasma gondii* in adult is very low, but it could cause devastating effects including eye blindness, neurological impairment and mental retardation in congenitally infected children. Despite, the untold hardship caused by this parasite on the children of infected pregnant women, information on the seroprevalence of *Toxoplasma gondii* in Lagos is limited. Two hundred and seventy six pregnant women attending antenatal clinic for the first time were screened for Toxoplasma antibodies using Enzyme Immunoassay and structured questionnaire was used to obtain information on risk factors associated with infection. Out of the 276 women tested, 21 (7.6) and 90 (32.6) has Toxoplasma IgM and Toxoplasma IgG respectively. Toxoplasma IgM was common in the first trimester (16.7) while Toxoplasma IgG was seen mostly in the third trimester (46.7). Seroprevalence of Toxoplasma IgM and IgG was seen to be significantly associated with parity ( $p < 0.05$ ). Toxoplasma IgG were found to be significantly associated with age of the women. Histories of farming, still birth, eating of raw vegetables were associated with seroprevalence of Toxoplasma IgG. The results of this show that the seroprevalence rate is still low and there is the need to include the testing of Toxoplasma as a part of the antenatal investigation done on pregnant women and to educate women about the risk factors that lead to Toxoplasma infection in order to reduce congenital malformations and death as a result of these infections

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### 1. Introduction

Toxoplasmosis has been described as the most widespread zoonotic infection caused by an intracellular parasite called *Toxoplasma gondii*, [1, 2] Although, the mortality rate of this parasite in adult is very low but it causes devastating effects including blindness, neurological impairment and mental retardation in congenitally infected children [1, 2, 3, 4]. *Toxoplasma gondii* was implicated as significant cause of foetal and neonatal mortality when acquired in-utero and an important contributor to early and later childhood morbidity.

Congenital infection occurs only when a woman becomes infected during pregnancy and the severity of the illness is related to the trimester period. It was observed that congenital infections acquired during the first trimester are more severe than those acquired in the second and third trimester [3].

In addition, the infection with *T. gondii* is usually asymptomatic in immunocompetent hosts but can cause devastating disease in immunocompromised individuals.

However, the seroprevalence of *Toxoplasma gondii* in human population varies greatly among different countries, geographical areas within the same country, and among the ethnic groups living in the same area [3, 6, 7]. In Nigeria the seroprevalence rates of toxoplasmosis by serological investigations have been estimated to vary from 7% to 51.3% in normal pregnant women to 17.5% to 52.3% in women with abnormal pregnancies and abortions [8, 9]. Ishaku et al [10], reported prevalence rates to be 29.1% and 0.8% for chronic and acute infections respectively,

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Also, seroprevalence rates of 40.2% from Senegal [11]; and 34.1% from pregnant women in Sudan were reported [12]. In Southern Turkey anti-Toxoplasma IgG and IgM antibody was found to be 52.1% and 0.54% respectively [13]. Nissapatorn et al., [14] found significant differences in *Toxoplasma* seroprevalence rates among the races where: the highest rate was in the Malaysia (55.7%), followed by the Indian (55.3%) and the Chinese (19.4%) populations.

Transmission of *T. gondii* is through Food-borne, with cats playing the major role in the transmission, through faecal contamination of soil, food or water. Humans and domestic animals acquire infection by consumption of improperly cooked meat and unpasteurized goats' milk [2, 6, 15].

Detection of recently acquired infection with *Toxoplasma gondii* is important in pregnant women for prevention of transmission of the infection to their fetuses [2, 16]. Unfortunately, up till now, Toxoplasma is not a reportable disease in Nigeria and screening of pregnant women for this parasite is not part of the routine test carried out on them, thus, congenital abnormality cases are still being seen in the hospitals. Despite the untold hardship caused by this parasite on the children of infected pregnant women, information on the seroprevalence of *Toxoplasma gondii* in Lagos is limited. This study was therefore designed to determine the seroprevalence of *Toxoplasma gondii* and associated risk factors among pregnant women attending ante-natal clinic.

## 2. Materials and Method

### 2.1. Sample Collection

This work was granted ethical clearance by the Ethical committee, of the Federal Medical Centre, Lagos state, Nigeria. The aim of this study was clearly explained to the pregnant women attending Ante-natal Clinic for the first time and informed consent obtained before administering questionnaire. Blood samples were collected by venepuncture. Samples were then centrifuged at 1500 rpm for 10 minutes to separate serum. Serum samples were then kept at -200C until assayed.

### 2.2. Specimen Analysis

All specimen and kit reagents are brought to room temperature (23 - 25°C) and gently mixed before assay. All reagents are ready to use except the washing solution which was diluted 1:25 with distilled water before use. Sera samples were screened for the presence of Toxoplasma IgM, and Toxoplasma IgG antibodies by Enzyme Immunoassay using BIOTEC IgM and IgG EIA kits (BIOTEC Laboratories Ltd, 32 Anson Road, Ipswich, Suffolk, United Kingdom) according to manufacturers instructions.

### 2.3. Interpretation of results

A negative result indicates that there was no prior exposure to *Toxoplasma gondii*. These individuals are presumed to be susceptible to a primary infection. A positive result indicates that there was a prior exposure at some undetermined time to *Toxoplasma gondii*. A highly positive result may indicate acute or recent disease.

### 2.4. Statistical analyses

Descriptive statistical analysis was performed using SPSS 17.0. All statistical analyses were carried out using a 95% confidence interval, a significance level of  $P < 0.05$  and Chi square test of independence was carried out for all contingency table. Odds ratio

(OR) was evaluated for significant risk factors. Questionnaires administered were evaluated to determine the correlation between seroprevalence and several risk factors using Two-tailed test of significance.

## 3. Results

Out of the 276 pregnant women examined for seroprevalence of Toxoplasma, 21(7.6%) and 90(32.6%) were positive for Toxoplasma IgM and Toxoplasma IgG respectively (Table 1). A total number of 72 (26.4%) of the pregnant women were in their first trimester, 156 (57.1%) in the second trimester and 45(16.5%) in the third trimester. Seroprevalence of Toxoplasma IgM was 16.7%, 3.9%, and 6.7% for first trimester, second trimester and third trimester respectively; the seroprevalence of Toxoplasma IgG was 25%, 30.8%, and 46.7% for first trimester, second trimester and third trimester respectively; Toxoplasma IgM (OR 2.487, 95% CI 1.174, 5.269,  $P = 0.003$ ) and Toxoplasma IgG (OR 0.623, 95% CI 0.417, 0.931,  $P = 0.045$ ) was found to be significantly associated with gestational age (Table 1).

**Table 1: Seroprevalence Of Toxoplasma Igm And Igg According To Age-group.**

Age group (years)	Toxoplasma IgM			p-value	Toxoplasma IgG		
	Total N (%)	POS n (%)	NEG n (%)		POS n (%)	NEG n (%)	p-value
<20	3 (1.1)	0 (0)	3 (100)	0.841	0 (0)	3 (100)	$P = 0.001$
21 – 25	30 (11.2)	3 (10)	27 (90)		3 (10)	27 (90)	
26 – 30	75 (28.1)	3 (4.0)	72 (96)		9 (12)	66 (88)	
31 – 35	117 (43.8)	9 (7.7)	108 (92.3)		9 (7.7)	108 (92.3)	
36 – 40	39 (14.6)	3 (7.7)	36 (92.3)		6 (15.4)	33 (84.6)	
41 – 45	3 (1.1)	0 (0)	3 (100)		0 (0)	3 (100)	
Total	276 (100)	21 (7.6)	255 (92.4)		90 (32.6)	186 (67.4)+	

The distribution of the pregnant women according to parity showed that 77(28.4) of them are Primigravidas while 194(71.6) are multigravidas. Significant association was found to exist between seroprevalence and parity in the case of Toxoplasma IgG ( $\chi^2 = 3.993$ ,  $P = 0.014$ ) and Toxoplasma IgM ( $\chi^2 = 6.010$ ,  $P = 0.046$ ).

Table 2 shows the seroprevalence according to the age-group of the subjects studied. The subjects studied fall within the age group >20 and 41-45. A significant association was found between Toxoplasma IgG and age-group of the subjects in this study (OR 0.631, 95% CI 0.469, 0.849,  $P = 0.001$ ). Seroprevalence of Toxoplasma IgM ( $P = 0.841$ ) in relation to age-group was not significant.

Toxoplasma IgM seroprevalence is significantly associated with history of eye problem (OR 3.643, 95% CI 1.443, 9.195,  $P = 0.004$ ). A significant association was found to exist between Toxoplasma IgG and history of engaging in farming (OR 3.069, 95% CI 2.583, 3.647,  $P = 0.014$ ). Toxoplasma IgG was found to be significantly associated with history of still birth (OR 0.350, 95% CI 0.140, 0.870,  $P = 0.019$ ) and eating of uncooked vegetables (OR 2.790, 95% CI 1.400, 5.559,  $P = 0.003$ ). 201 (72.8%) of the study population had education up to

the tertiary level, 69(25.0%) secondary level and 6(2.2%) the primary education level. Toxoplasma IgM positivity was found to be associated significantly with the level of education (OR 0.333, 95%CI 0.113, 0.982, P=0.019). However, Toxoplasma IgG (P=0.133) were not significantly associated with the level of education. (Table 2)

**Table 2: Seroprevalence Of Toxoplasma According To Risk Factors**

Risk factor	Number Sampled	Toxoplasma IgM	P-value	Toxoplasma IgG	P-value
Cats in Household					
Yes	6	0	0.472	0	0.088
No	263	21 (8.0)		87 (33.1)	
No Response	7	0		3 (42.9)	
Handle cats litters					
Yes	3	0	0.602	0	0.222
No	252	21(8.3)		84 (33.3)	
No Response	21	0		6 (28.6)	
Outdoor gardening					
Yes	18	31(6.7)	0.170	9(50.0)	0.102
No	240	18(7.5%)		75(31.3)	
No Response	18	0		6(33.3)	
Engage in farming					
Yes	3	0	0.613	3(100.0)	0.014
No	267	21(7.9)		87(32.6)	
No Response	6	0		0	
Consume raw meat					
Yes	3	0	0.617	0	0.226
No	273	21(7.7)		90(33.0)	
No Response	0	0		0	
Vegetables					
Yes	39	3(7.7)	1.000	21(53.9)	0.003
No	234	18(7.7)		69(29.5)	
No Response	3	0		0	
Not washing fruits					
Yes	6	0	0.477	0	0.085
No	270	21(7.7)		90(33.3)	
No Response	0	0		0	
Contact with dogs					
Yes	18	0	0.205	6(33.3)	0.973
No	255	21(8.2)		84(33.0)	
No Response	3	0		0	
Miscarriage					
Yes	63	3(4.8)	0.307	15(23.8)	0.153
No	207	18(8.7)		69(33.3)	
No Response	6	0		6(100)	
Still birth					
Yes	39	3(7.7)	0.965	6(15.4)	0.019
No	228	18(7.9)		78(34.2)	
No Response	9	0		6(66.7%)	
Eye problem					
Yes	51	9(17.7)	0.004	15(29.4)	0.726
No	216	12(5.6)		69(31.9)	
No Response	9	0		6(66.7)	
Primary Education					
Yes	6 (2.2)	0 (0)	0.019	3 (50)	0.133
No		6 (100)		3 (50)	
				21 (30.4)	
Secondary Education	69 (25)	0 (0)			
Yes		69 (100)			
No				48 (17.4)	
Tertiary Education	201 (72.8)	21 (7.6)		66 (23.9)	
Yes		180 (65.2)		135 (48.9)	
No					

#### 4. Discussion

The most serious form of *Toxoplasma* infection is Congenital Toxoplasmosis which is accompanied by serious foetal complication based on gestational age at the time of infection. The seroprevalence of 32.6% obtained in this study for *Toxoplasma gondii* IgG is in line with that reported from Northern part of Nigeria, where an IgG seroprevalence of 29.1% was obtained among pregnant women [10], in Qatar a seroprevalence of 35.1% was found among women of child-bearing age [17], also in Trinidad and Tobago a seroprevalence of 39.3% was detected among expectant mother [4]. However, other studies reported higher rates than our findings of this study, Nigeria 40.8% [18], Gabon 56% [19], Benin Republic 53.6% [20] and Brazil 49.2% [22]

The 7.6% seroprevalence of *Toxoplasma* IgM in this study greatly differ from the 0.8% IgM reported from Northern Nigeria [10] 2.6% from Gabon [21], and of 5.2% from Qatar [17]. However, it is lower than of 11.9% reported in Trinidad and Tobago [4]. Significant association was found to exist between seroprevalence of *Toxoplasma* IgG, IgM and parity. The 7.6% IgM obtained in this study suggests a high prevalence of recent *Toxoplasma* infection among the pregnant women with more occurring in the first trimester (16.7%), than the second and third trimester. The risk of foetal infection is greater in the case of *Toxoplasma* recent infection in this study as the first trimester is the formative stage of the foetus, hence the likelihood of deformations and even death. The frequency and severity of foetal infection (via transplacental transmission) varies depending on factors such as the date of onset of the maternal infection, the virulence of the parasite strain, the size of the inoculum and the maternal immunity. Most congenital toxoplasmic infections are asymptomatic at birth and symptoms may appear later eg. blindness, mental retardation, chorioretinitis [16].

Seroprevalence of *T. gondii* infection has been shown to increase with age. This study also found effect of age on seroprevalence of *T. gondii* infection among antenatal women. The risk of exposure to *T. gondii* infection increases with age. This may contribute to the highest percentage positive per age group, 61.5%, was found in the 36 - 40 age-group. This also highlights the need to continue to educate women of child-bearing age on prevention of Toxoplasmosis. *Toxoplasma* seroprevalence was also found to be highest in those with lower level of education and reduces as the level of education increases. This finding is in agreement with the findings of other author who reported that lower levels of education were associated with increased risk for Toxoplasmosis [10].

*Toxoplasma* IgM seroprevalence association with history of eye problem was found to be statistically significant in this study. A theree is association between *Toxoplasma* IgG seropositivity and history of engaging in farming, still birth, and eating of uncooked vegetables. Although other authors have reported an association between *Toxoplasma* infections and housing of cat or their litters, consumption of raw meat, engaging in outdoor gardening [22] and history of miscarriage, however, no association was found between these risk factors and seroprevalence of *toxoplasma* IgM and IgG in this study.

This study has shown that the seroprevalence of *Toxoplasma* IgG is low within the community consequently there is an elevated risk of primary infection during pregnancy and the potential for congenital infection. This is further buttressed with a higher percentage of suggestive recent infection, *Toxoplasma* IgM, which was seen among the pregnant women in this study.

There is the need to include the testing of *Toxoplasma* as a part of the antenatal investigation and educate pregnant women on the risk factors associated with *Toxoplasma* infection.

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