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Seroprevalnce of Toxoplasmosis among Sudanese Pregnant women attending maternal centers in Sudan in 2021

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Abstract:

Background. *Toxoplasma gondii protozoon is widely distributed around the world and can infect all mammals and birds. While acquired toxoplasmosis is usually asymptomatic in healthy subjects, acute infection during pregnancy may lead to abortion, stillbirth, fetal neurological and ocular damages.it is necessary to determine the seroprevalence of toxoplasmosis in pregnant women and the actual risk of T. gondii transmission during pregnancy in a certain area.*

Method: *This was a cross-sectional descriptive study carried out between April 2015 and October 2016 involving 200 pregnant*

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women attending antenatal care at selected health centers to determine prevalence of toxoplasmosis among pregnant women using PCR.

Result: *Residence shows marked significance with a p value of 0.0003 (p value >0.05). 16 (9.20%) of the pregnant women who tested positive for toxoplasmosis live in Urban areas while 10 (38.50%) females live in rural areas, while the majority of the remaining 174 participants who tested negative for toxoplasmosis live mostly in urban areas 158 (90.8%) and only 16 (61.50%) live in rural parts of Sudan.*

Conclusion: *Residence is a high-risk factor for infection with toxoplasmosis in Sudan and PCR is considered to be the golden standard test for Toxoplasmosis. Advocating for the implementation of control and preventive measures and routine screening services for T. gondii infection.*

Keywords: Seroprevelance, Toxoplasma Gondii, Toxoplasmosis, PCR (Polymerase chain reaction) Antibodies, ELIS (Enzyme Linked Immunosorbent Assay)

INTRODUCTION

Human Toxoplasma Gondi infection is a problem which spans worldwide, with seroprevalence estimates ranging from 0 – 100% depending on the origin of the population studied (1). The protozoan parasite *Toxoplasma gondii* (*T. gondii*) is one of the most common parasites worldwide due to its ability to infect all warm-blooded animals including humans. T. gondii is a coccidian parasite and a member of the phylum Apicomplexa. Felines (the cat family) are the only hosts where sexual development (formation of oocysts), occurring in the intestinal epithelium, is known to take place.There are three main stages of T. gondii that are highly infectious to humans: the tachyzoites (in groups), the bradyzoites (in tissue cysts) and the sporozoites (in oocysts). Sporozoites, bradyzoites and tachyzoites of T. gondii are ultrastructurally similar. Congenital transmission of the parasite was the first mode of transmission to be recognized. Isolation of parasites from placenta and infected neonates suggested that the parasite was transferred from the maternal bloodstream via the placenta to the foetus. Despite a high seroprevalence in humans, the

immune system generally keeps the parasite under control and most healthy individuals are asymptomatic, however patients may experience mild flu like symptoms such as fever, myalgia or asthenia (2). Acquired toxoplasma infection is usually asymptomatic in immunocompetent humans. However, toxoplasmosis may present as nonspecific flulike symptoms, fatigue or gastroenteritis and with signs like lymphadenopathy or rash (1,2,3). Cervical lymph nodes are the nodes most commonly involved, and the liver and spleen may be affected (4,5,6,7,8,9,10). Chorioretinitis and opticus neuritis are reported in immunocompetent individuals, Diagnosis of toxoplasmosis in humans is generally based on serology and on histologic examination of tissues, as well as, molecular methods using the Polymerase Chain Reaction (PCR).

MATERIALS AND METHODS

This study was a cross-sectional descriptive study which was carried out between April 2015 and October 2016 among 200pregnant women aged 18 years and above who attended health care centerslocated in Khartoum state in the Republic of Sudan. Namely, Turkish Hospital and Fedail Specialized Hospital. Only those who agreed to participate by signing the consent form were included in the study while subjects with autoimmune disorders or those in immunosuppressive therapy were excluded from this study.

Furthermore, regarding collection of Data, the study participants were interviewed by administration of a standard questionnaire to obtain the socio-demographic and economic status information as well as epidemiological risk factors. As for detection of T. gondii antibodies (IgM and IgG) using ELISA assays, 5mL of venous blood were collected aseptically from each of the included pregnant women and divided into two EDTA anticoagulated containers. Plasma was separated from the whole blood in one container by centrifugation at 3,000 rpm for 5 minutes.

The collected data were computerized and analyzed by SPSS 23. The data were summarized numerically (mean, standard deviation and median) and graphically (frequency, tables and graphics) and tested by using multiple statistical tests.All statistical tests were considered significant when the $p\ value<0.05$.

RESULTS AND DISCUSSION

Demographic characteristics of women with toxoplasmosis:
The study included 200 pregnant female participants (100%) and **t**he results According to the age showed that the mean age of the participants was (29±7), with minimum age of 18 years old and maximum age of 42 years old. The bulk of the study group was from the age 20-29 years old 91(45.5%) followed by an age range between 30-39 years 78 (39%), 22 participants were less than 20 years old while only 9 (4.5%) participants were more than 39 years old as shown in **Figure [1]**. Moreover, 16 (20.50%) Pregnant women who were Seropositive for toxoplasmosis were 30-39 years old.

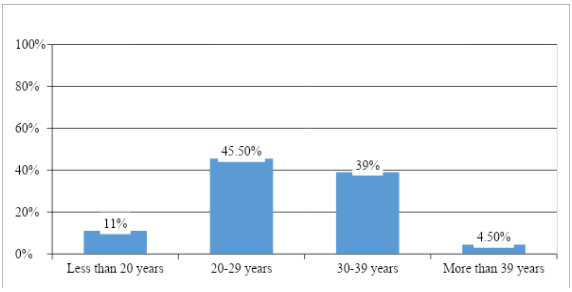

Figure [1] Distribution of age groups among participants

Regarding the residence, about quarter of the participants 26 (13%) were from rural areas such as Shandi, Aljazeera and other states while the majority were from Urban states 174 (87%) such as Khartoum state as shown in **Table [1]**. As for the Education level, 188 (94%) got an adequate education while few participants 12 (6%) were illiterate and did not get a proper education.

Table [1] Demographical variables among study group:

Variable	Number	Percent
Residence		
Urban	174	87%
Rural	26	13%
Education		
Educated	188	94%
Non-educated	12	6%
Total	200	100%

In **Table [2]** by using Fisher's exact test P value to explain the relationship between PCR and different variables, it comprehends that Residence is the only variable that shows marked significance with a p value of 0.0003 which is less than p value = 0.05. 16 (9.20%) of the pregnant women who tested positive for toxoplasmosis live in Urban areas while 10 (38.50%) females live in rural areas, while the majority of the remaining 174 participants who tested negative for toxoplasmosis live mostly in urban areas 158 (90.8%) and only 16 (61.50%) live in rural parts of Sudan.

However, Other variables, such as age (0.092>P value=0.05) education (0.054 >P value=0.05), Variables regarding participant's lifestyle habits such as, contact with cats (0.505>P value=0.05), eating raw meat (0.721>P value=0.05) and other variables regarding the females' clinical pregnancy history, the majority of the participants who were Seronegative for toxoplasmosis 146 (88.50%) was their first time being pregnant while about 28 (80.00%) were multigravida which means that the participant experienced more than one pregnancy. Other studies were in agreement and others may indicate limitations (11.12.13.14.15.6). And as those who tested negative, 19(11.50%) were prim gravida while 7 (20.00%) were multigravida which gives gravidity a p value of (0.141>P value=0.05) (16,17,18,19,20,21). Moreover, the times of miscarriage (0.070>P value=0.05) and still birth (0.083>P value=0.05) the participants experienced had no contribution to infection by toxoplasmosis. and despite all the variables contribution to the Fisher's exact statistical test, they were not statistically significant with p values of more than 0.05 (22,23,24,25,26,18).

Table [2] Shows cross-tabulation among variables and PCR testing using Fisher's exact test.

Variables		PCR		Fisher's Exact Test P value
		Negative	Positive	
Residence	Urban	158	16	0.0003**
		90.80%	9.20%	
	Rural	16	10	
		61.50%	38.50%	
Education	Educated	166	22	0.054*
		88.30%	11.70%	
	Non-educated	8	4	
		66.70%	33.30%	
Miscarriage	No	169	23	0.070*

		88.00%	12.00%	
	Yes	5	3	
		62.50%	37.50%	
Still birth	No	172	24	0.083*
		87.80%	12.20%	
	Yes	2	2	
		50.00%	50.00%	
Contact with cats	No	170	25	0.505*
		87.20%	12.80%	
	Yes	4	1	
		80.00%	20.00%	
Eating raw meat	No	167	25	0.721*
		87.00%	13.00%	
	Yes	7	1	
		87.50%	12.50%	
Gravidity	Primigravida	146	19	0.141*
		88.50%	11.50%	
	Multigravida	28	7	
		80.00%	20.00%	
Age groups	Less than 20 years	21	1	0.092*
		95.50%	4.50%	
	20-29 years	82	9	
		90.10%	9.90%	
	30-39 years	62	16	
		79.50%	20.50%	
	More than 39 years	9	0	
		100.00%	0.00%	

Geographic location, place of residence in particular has been found to be another form of disparity. According to PCR results 10 participants (38.5%) of rural resident out of total 26 reported positively for technique *T. gondii* antigen detection while 16 (9.2%) out of 174 participants of Urban areas.

However, findings in this study is agreement with other study (27,28,29,30), that aborted women with toxoplasmosis are more common in rural area. This is due to the human in rural area were contact with animals either in house or farms by working and can be contaminated with cat and other animal's feces in soil of garden or farms or unwashed fruits and vegetables. Pet animals particularly cat is a major source of transmission of *Toxoplasma* infection in human and showed higher molecular-seropositivity among the patients who had close contact with cat, which agree with present study that reveal the relationship between toxoplasmosis and presence or absence of animals

in houses (26,27,18). Although toxoplasmosis can be transmitted by uncooked or inadequate cooked food or meat in addition to that the cats found in the household or inside the house of farmers than others in urban regions, other studiesdon't show a relationship between resident location of patient and percent of infection (31).

High prevalence of *Toxoplasma* infection in women may be attributed to the low level of education in which they reside, (33.3%) of patients have illiterate or incomplete primary school were infected with *Toxoplasma while 11.7% of educated women infected with*. The presented study is in agreement with the study that occurred in Kirkuk city that found that the distribution of *T. gondii*antibodies in sera of patients among literate level (33.33%) and (32.24%) among primary school level (32).

Miscarriage and abortion in this study recorded insignificant association between molecular detection with figures positive cases of 23 (12%) out of 192 in non-miscarriage or aborted women. While only 3 molecular-seropositive showed in miscarriage cases with value 0.07.

CONCLUSION

Based on the findings of this study, it is concluded that existence of disease in rural areas with contact of cats and animals at homes and farms, consumption of undercooked meat and unpasteurized milk were identified as risk factors for T. gondii infection. The findings of this study demonstrated a relatively lower prevalence of molecular-seropositivity than studies reported from other countries (19.30.31.32). Therefore, a health education program to increase the mother's knowledge about toxoplasmosis towards the source of infection, modes of transmission and prevention methods by avoiding eating raw or undercooked meat, contact with cats and consumption of unpasteurized milk during pregnancy is recommended. Moreover, health information, especially on the *Toxoplasma* transmission routes to women before marriage, particularly for the seronegative women, must be provided and easily available. Additionally, indicating the sensitivity of a woman to acute toxoplasmosis, as well as the serological assessment of toxoplasmosis, before and during pregnancy, is also recommended (21,18).

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