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Associated risk factors of Toxoplasmosis in Pregnant Women attending Antenatal care at Sir Yahaya Memorial Hospital, Birnin Kebbi, Northwestern NigeriaNuhu Hussaini Shehu*¹, Makun Babazhitsu²Ministry of Animal Health, Husbandry and Fisheries, Birnin Kebbi, Kebbi State, Nigeria¹, Department of Medical Microbiology and Parasitology, Faculty of Basic Clinical sciences,College of Health Sciences, Usmanu Danfodiyo University of Sokoto, Sokoto State, Nigeria².Author for Correspondence*: nuhusaini084@gmail.com/+234-803-507-5598/
<https://dx.doi.org/10.4314/sokjmls.v6i4.7>**Abstract:**

Toxoplasmosis is a common worldwide infection caused by the protozoan *Toxoplasma gondii*. It is an obligate intracellular protozoan parasite in animals and humans. Maternal infection with toxoplasmosis throughout pregnancy is frequently associated with vertical transmission to the foetus. The aim of this study was to determine the seroprevalence and risk factors of toxoplasmosis among pregnant women at Sir Yahaya Memorial Hospital, Birnin Kebbi. It was a cross sectional, descriptive study. Serological tests by the indirect Enzyme Linked Immunosorbent Assay (ELISA) for IgG was carried out on 340 pregnant women visiting Sir Yahaya Memorial Hospital, Birnin Kebbi, Northwestern Nigeria. The overall seroprevalence of *Toxoplasma* antibodies was 33.3%. 9.7% seropositivity was found among subjects in the first trimester, 60.5% in the second trimester and 29.8% from third trimester. Lack of education, lower age at pregnancy, and frequency of close contacts with cats were significantly associated with the prevalence of IgG antibodies. The strongest risk factors for toxoplasmosis from this study was in people living with cats and domestic pets and women who frequently consumed raw meat.

Keywords: Toxoplasmosis, survey, risk factors, primary prevention

Introduction

Infection caused by *T. gondii* is considered a global zoonotic disease of public health importance. The distribution of this parasite depends on the country and weather conditions where the oocysts survive in environment. It is estimated that between 30% and 65% of all

people in the world are infected with toxoplasma. Toxoplasmosis in immunocompetent adults is a self-limiting infection but can cause congenital infection with significant foetal morbidity and mortality when primary infection occurs during pregnancy. Pregnant women who acquire infection from *Toxoplasma gondii* usually remain asymptomatic, although they can still transmit the infection to their fetuses with severe consequences. Infection is acquired by ingesting oocysts excreted in cat faeces or eating raw or undercooked meat from infected animals containing tissue cysts. The relative importance of these two sources of infection in this study area is unknown and provides the purpose for undertaking this study. Congenital toxoplasmosis is rare, occurring in an estimated 400–4000 newborns per year in the USA, but it can cause severe manifestations. These range from miscarriage to microcephaly, hydrocephalus, seizures, mental retardation and chorioretinitis. Chorioretinitis with significant visual loss can also be a late complication of congenital infection in children who were asymptomatic at birth. Knowledge of the life cycle of *T. gondii* is necessary to understand how to advise women to decrease their risk of primary toxoplasmosis while pregnant. Naturally, *T. gondii* exists in 3 forms during its lifecycle. Oocysts are the product of sexual reproduction, which occurs in the small intestine of a cat only after it is first exposed to infected meat (uncooked meat or small rodents) containing tissue cysts. Oocysts are then excreted in the feces of a cat for approximately 2 weeks following its first exposure to infected meat, and they become infectious 1–5 days following defecation.

Tissue cysts contain bradyzoites, which are slowly dividing *T. gondii* contained by an immune response. Tachyzoites are the asexual, rapidly dividing forms of *T. gondii* that disseminate through a host before any adequate immune response. Acquisition of Tachyzoites is from ingestion of uncooked tissue cysts or infective oocysts. They circulate for 7–10 days before being contained in tissue cysts if there is an adequate immune response. It is the tachyzoite form of *T. gondii* that can cross the placenta and lead to congenital toxoplasmosis.

Pregnant women who have not previously been infected by *T. gondii* can become infected by either ingestion of tissue cysts in undercooked meat or ingestion of infective oocysts deposited by a recently infected cat. Multiple studies have addressed the contribution of various risk factors to seroconversion and thus primary infection with *T. gondii* during pregnancy. These studies have found the most significant risk factor to be undercooked meat consumption (Kapperud et al., 1996; Bobić et al., 1998; Baril et al., 1999; Cook et al., 2000). It was estimated that up to 63% of seroconversions during pregnancy were secondary to undercooked meat consumption.

Furthermore, these studies also demonstrated a strong association between soil contact via gardening or eating raw or unwashed vegetables and fruits with *T. gondii* seroconversion. Two studies found contact with cat litter to be a risk factor, whereas two studies found no association between contact with cats or cat litter and *T. gondii* seroconversion. Other risk factors include infrequent washing of kitchen knives used to cut raw meat and travel outside the USA, Europe or Canada. From the foregoing however, consumption of undercooked meat is without doubt the primary risk factor for toxoplasmosis transmission, all pregnant women should be counseled to thoroughly cook all meat during pregnancy. Furthermore, since fetal infections in first trimester tend to cause more severe birth defects, family physicians who see women before their first obstetrician appointment need to be made aware of the need to counsel women on the risk of undercooked meat consumption.

Materials and methods:

Study Area

Birnin Kebbi is a city located in North-Western Nigeria and lies between 12.45°N latitude and 4.2°E longitude. It is the capital city of Kebbi State and headquarters of the Gwandu Emirate. The city is connected by road to Argungu 45km Northeast, Jega 35km Southeast and Bunza 45km Southwest (Kebbi State, 2015). Based on the 2006 census the city has a population of 268,620 (males 135,426 & females 133,194), mostly Hausa and Fulani, with Islam as the major religion.

The study was carried out at Sir Yahaya Memorial Hospital Birnin Kebbi. The hospital is a secondary health care institution in the metropolis and a referral centre within the state. Its protocols and services are easily accessible, cheap and affordable.

Study Design

This was a cross sectional study and involved the use of convenient sampling. The study was implemented within a period of two months (November to December, 2015).

Ethical Consideration

Ethical clearance was sought and obtained from Ethical Committee of Sir Yahaya Memorial Hospital, Birnin Kebbi, Kebbi State, before commencement of the study. The pregnant women were adequately briefed that participation is voluntary. The purpose, benefit and their roles in the study was explained and the confidentiality of the information obtained was assured to them. Written informed consent was obtained from all the subjects before the study was conducted.

Study Population

A total of 342 consecutively-recruited pregnant women attending Antenatal Clinic at Sir Yahaya Memorial Hospital, Birnin Kebbi constituted the subjects for this study.

Serological study

Blood samples were collected from each participant and centrifuged at 1200rpm/min and the sera were separated into labelled vials and stored at 4°C and then tested for the presence of *T. gondii* antibodies using the indirect Enzyme

Linked Immunosorbent Assay (ELISA) method and anti-*Toxoplasma* IgG (Nova Tec Immunodiagnostic, Germany).

Results

Three hundred and forty-two pregnant women participated in this study. Twenty-five representing 7.3% were in first trimester, 200 (58.5%) in second trimester and 117 (34.2%) in third trimester. A total of 114 participants representing 33.3% tested positive for toxoplasmosis. On trimester distribution, 11 (9.7%) were from first trimester, 69 (60.5%) from second trimester and 34 (29.8%) from third trimester. Also, eleven (11) risk factors and reproductive history were assessed and three (3)

(miscarriage, consumption of raw vegetable and interaction with cats) were found to have significant association with *Toxoplasma gondii* infection. Infection was observed to be higher in pregnant women who had registered in the age category 30 years and below (34.0%) while those above 30 years had prevalence of 28.9%. Based on the level of educational attainment among the subjects, infection was slightly higher among women not educated (34.3%) compared to those educated (32.4%). Also, based on the ethnicity, the infection was higher in other tribes (38.2%) compared to the Hausa/Fulani (32.8%). And of all these, none was found to have any significant association with the infection ($p > 0.05$).

Table 1.0: Chi Square Analysis of Risk Factors for Toxoplasmosis in Pregnant Women Attending ANC at Sir Yahaya Memorial Hospital, Birnin Kebbi.

Risk factor	Response	Prevalence (%)	Chi-sq. value	P-value	OR	95% CI
Consumption of cooked meat	Yes	93/273(34.1)	0.327	0.568	1.181	0.667-2.090
	No	21/69 (30.4)		Ref	1.0	NA
Consumption of roasted meat	Yes	111/330(33.6)	0.389	0.533	1.521	0.404-5.729
	No	3/12 (25.0)		Ref	1.0	NA
Consumption of raw meat	Yes	2/4 (50.0)	0.506	0.477	2.018	0.281-14.513
	No	112/338(33.1)		Ref	1.0	NA
Consumption of raw vegetable	Yes	31/55(56.4)	15.643	0.000	0.315	0.174-0.569
	No	83/287(28.9)		Ref	1.0	NA
Consumption of cooked vegetable	Yes	113/340(33.2)	0.251	Ref	1.0	NA
	No	1/2 (50.0)		0.616	0.498	0.031-8.032
Washing vegetable with water	Yes	70/215(32.6)	0.157	Ref	1.0	NA
	No	44/127(34.6)		0.692	0.911	0.573-1.448
Washing vegetable with salt & water	Yes	78/231 (33.8)	0.060	0.806	1.062	0.656-1.720
	No	36/111 (32.4)		Ref	1.0	NA
History of blood transfusion	Yes	10/27 (37.0)	0.181	0.671	1.193	0.528-2.698
	No	104/315(33.0)		Ref	1.0	NA

Level of significance= 0.05

Table 2.0 Analysis of Toxoplasmosis in Pregnant Women living with Cats and other Animals Attending ANC at Sir Yahaya Memorial Hospital, Birnin Kebbi n=103

Risk factor	Prevalence (%)	P-value	OR	95% CI
Interaction with cats	31(30.1)	0.049	1.784	1.003-3.173
Interaction with other animals	29(28.2)	Ref	NA	NA
Interaction with both	43(41.7)	0.050	1.871	0.999-3.503

Level of significance= 0.05

Discussion

The prevalence of 33.3% of Toxoplasmosis recorded in this study is suggestive that the disease may be endemic in Birnin Kebbi town. However, there is variation with what was observed from some of the previous studies carried out in certain parts of the country. For instance, in a study carried in Sokoto using Latex Agglutination test, they observed a prevalence rate of 27.7% in pregnant women in Sokoto (Sukthana, 2006). Frequency of consumption of various foods was analyzed using a chi square analysis. It showed women who consumed raw meat were more at risk for toxoplasmosis. In this study, all the women wash vegetables with ordinary water, 231 women added salt in water and none washed with vinegar. Human infection in the study area may be attributed to the consumption of contaminated food products eaten which might be improperly washed (vegetables, carrots, garden eggs, salad) or inadequately cooked (roasted meat and barbecue). It was observed in the present study, that a good number of humans are living in co-existence with animals. This is of epidemiological and zoonotic interest. Dogs were also found in the study area. In most cases, the dogs are left to scavenge exposing them to the danger of being infected since the dogs are more likely to pick oocysts from feline definitive hosts. The proportion of cats in the study area is more than that of dogs. Cats are widely kept by many of the households, primarily to keep rat population down, with little or no care for them. This resulted in many of them turning out as stray cats. The interaction of stray cats with pregnant women also increased the likelihood of infection to both canine and human populations. The prevalence of Toxoplasma infection in humans is often associated with the infection in livestock living in the same

environment (Aganga and Ortese, 1984). Living with cats was an important risk factor in the epidemiology of Toxoplasmosis. Perhaps it was a major determinant of Toxoplasmosis infection in the study area, this is in agreement with findings elsewhere (Sukthana, 2006).

Conclusion

The strongest risk factors for toxoplasmosis we found from this study was in households of people living with cats and domestic pets. Another risk factor was also seen in women who frequently consumed raw meat. Feeding on raw meat and inadequate washing of vegetables were significantly associated with toxoplasma seropositivity.

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Conflict of interest: None

Recommendations

1. Health education and awareness on the disease should be created during antenatal follow up to reduce the risk of *T. gondii* infection in pregnant women.
2. The data obtained signifies the need for further research by involving other local governments, so as to have a better picture of the state at large.
3. Further studies are warranted to investigate the possible sources of infection and the health burden toxoplasmosis is posing on the people of Kebbi State.

4. Individuals handling vegetables should wash their hands thoroughly with soap and water before they begin other tasks.
5. In future, study test involving molecular tools should be employed so as to know the circulating isolates and strain available in the state.
6. Toxoplasmosis screening should be made part of the routine tests in pregnancy in our hospitals and clinics to avoid congenital form of toxoplasmosis.

References

- Alayande, M., Edungbola, L., Fabiyi, J., Awosan, K. (2013). Occurrence of antibody to *Toxoplasma* infection among pregnant women with obstetric histories and at different trimesters in Sokoto, Northwest Nigeria. *American Journal of Research Communication*; **1(9)**:240-247.
- Aganga, A., Ortese, A. (1984). A serological survey of *Toxoplasma gondii* in pet dogs in Nigeria. *British Veterinary Journal*; **140(2)**: 207-209.
- Baril, L., Ancelle, T., Goulet, V., Thulliez, P., Tirard-Fleury, V., Carme, B. (1999). Risk factors for *Toxoplasma* infection in pregnancy: a case-control study in France. *Scandinavian Journal of Infectious Diseases*; **31(3)**:305-309.
- Bobić, B., Jevremović, I., Marinković, J., Šibalić, D., Djurković-Djaković, O. (1998). Risk factors for *Toxoplasma* infection in a reproductive age female population in the area of Belgrade, Yugoslavia. *European Journal of Epidemiology*; **14(6)**:605-610.
- CDC (2000). Prevention. CDC recommendations regarding selected conditions affecting women's health: US Department of Health and Human Services, Centers for Disease Control, 2000.
- Coelho, R.A., Kobayashi, M., Carvalho, Jr. L.B. (2003). Prevalence of IgG antibodies specific to *Toxoplasma gondii* among blood donors in Recife, Northeast Brazil. *Revista do Instituto de Medicina Tropical de São Paulo*; **45**:229-231.
- Cook, A., Holliman, R., Gilbert, R., Buffolano, W., Zufferey, J., Petersen, E. (2000). Sources of toxoplasma infection in pregnant women: European multicentre case-control study *Commentary: Congenital toxoplasmosis—further thought for food*. *British Medical Journal*; **321(7254)**:142-147.
- Dubey J.P. (2016). *Toxoplasmosis of animals and humans*: CRC Press, 2016.
- Dubey, J. (2009). History of the discovery of the life cycle of *Toxoplasma gondii*. *International Journal for Parasitology*; **39(8)**:877-882.
- Dubey, J., Murata, F., Cerqueira-Cézar, C., Kwok, O., Villena, I. (2021). Congenital toxoplasmosis in humans: an update of worldwide rate of congenital infections. *Parasitology*; **148(12)**:1406-1416.
- Kapperud, G., Jennum, P.A., Stray-Pedersen, B., Melby, K.K., Eskild, A., Eng, J. (1996). Risk factors for *Toxoplasma gondii* infection in pregnancy: results of a prospective case-control study in Norway. *American Journal of Epidemiology*; **144(4)**:405-412.
- Kravetz, J.D., Federman, D.G. (2005). Prevention of toxoplasmosis in pregnancy: knowledge of risk factors. *Infectious Diseases in Obstetrics and Gynecology*; **13(3)**:161-165.
- Mandelbrot, L. (2020). Congenital toxoplasmosis: What is the evidence for chemoprophylaxis to prevent fetal infection? *Prenatal Diagnosis*; **40(13)**:1693-1702.
- Onwuka, G., Babyemi, W., Ajala, S., Shehu, B. (2021). Evaluation of Demographic Data of Kebbi State North-West Nigeria Using the Nigerian Census. *Journal of Mathematical Sciences & Computational Mathematics*; **2(3)**:452-466.
- Sukthana, Y. (2006). Toxoplasmosis: beyond animals to humans. *Trends in Parasitology*; **22(3)**:137-142.

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