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RESEARCH PAPER

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### Prevalence of Toxoplasmosis among Pregnant Gynecological Women in Tendalty Hospital, Tendalty town, White Nile State, Sudan

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#### ABSTRACT

*Toxoplasma gondii* is a protozoan parasite of warm-blooded animals including man. It has a worldwide distribution. Hundred and four serum samples were collected from pregnant and gynecological women in tendalty in Wile Nile State and examined to determine the prevalence of toxoplasmosis. Samples were screened for the parasite using latex agglutination test (antigen, antibody reaction) The overall prevalence of parasite was found to be 38.5% we recommended proposing further epidemiological study to correlate abortion and fever to toxoplasmosis and controlling the number of domestic cats and avoiding the contamination of hands, food and water to decrease the incidence of the disease.

**Keywords:** *Toxoplasma gondii*, Pregnant and Gynecological Women.

## INTRODUCTION

Toxoplasmosis is caused by infection with the obligate intracellular protozoan parasite *Toxoplasma gondii* (*T.gondii*). It is one of the most prevalent chronic infections affecting one third of the world's human population (Jones, *et-al*, 2001). One of the major consequences of pregnant women becoming infected by *Toxoplasma gondii* is vertical transmission to the fetus. Although rare, congenital toxoplasmosis can cause severe neurological or ocular disease (leading to blindness), as well as cardiac and cerebral anomalies. (Caroline Paquet *et-al.*, 2013). *Toxoplasma gondii* infection acquired by pregnant women during gestation and their transmissions to the fetus continue to be the cause of tragic yet preventable disease in the offspring. In addition to the unfortunate outcome for infants and children are the emotional and economic burdens faced by the parents and society. It has been estimated that 500–5000 infants each year are born with congenital toxoplasmosis in the United States. Although the majority of infants appear to be healthy at birth, significant long-term sequelae may become obvious only months or years later (Roberts and Frenkel, 1990). Toxoplasmosis is a widely-distributed zoonosis caused by *Toxoplasma gondii* protozoa, although there is a high prevalence of unapparent infections, toxoplasmosis can develop into a severe systemic illness when in its congenital form, in which the mother, when infected for the first time during pregnancy, can present a temporary parasitemy with focal lesions generated within the placenta, thereby infecting the fetus. The parasite reaches the fetus transplacentally, causing various degrees of damage, depending on the virulence of the parasite, on the immune response of the mother and on the pregnancy period of the woman when infected, resulting in fetal death or in severe clinical symptoms (Fabiana, *et-al.*, 2007.). Epidemiological studies recording prevalence of *T. gondii* infection in pregnant women around the world indicate considerable variation between countries, ranging, for example, from 9% to 67% in European countries and reaching as high as 92.5% in Ghana. Similarly, high prevalence of *T. gondii* infection has also been found in some American countries. In contrast, prevalence was relatively low in East Asian countries, especially in Korea and Japan. (Wei Cong, *et-al*, 2015). *Toxoplasma gondii* infection is widespread in humans although its prevalence varies widely from place to place and it is estimated that up to fifty million people worldwide are infected. Abortion and fever due to unknown causes were observe in Tendalty hospital record during the last years cover a period of June 2015 to January 2016 to determine the prevalence of toxoplasmosis among pregnant women attending to Tendalty hospital for delivery, White Nile State, Sudan from June 2015 to January 2016. *Toxoplasma gondii* infection is widespread in humans although its prevalence varies widely from place to place and it is estimated that up to fifty million people worldwide are infected. Overall, less than 0.1% of the general population has been studied to be infected congenitally (Oyibo, *et-al.*, 2009). A protozoan parasite estimated to infect over one billion people worldwide. Two main routes of transmission have been described in humans:- By oral ingestion of the parasite and through placental transmission to the fetus. The organism is horizontally transmitted to humans by accidental ingestion of water, food, or soil contaminated with *T. gondii* oocysts or consumption of meat containing *T. gondii* cysts that is eaten raw or undercooked (Fernando ,*et-al.*,2008). *T. gondii* can be vertically transmitted to the fetus during pregnancy and may cause a wide range of clinical manifestations in the offspring depending on the gestational age at which the primary maternal infection was acquired, the virulence of the parasite, and the immunologic development of the fetus (Fernando, *et-al*, 2008). *T. gondii* is a tissue-cyst-forming coccidium functioning in a prey-predator system that alternates between definitive

(sexual reproduction) and intermediate (asexual replication) hosts. It is unique among this group because it can be transmitted not only between intermediate and definitive hosts (sexual cycle) but also between intermediate hosts via carnivorousness (asexual cycle) or even between definitive hosts. The parts of the sexual and asexual cycles and transmission dynamics in a given environment vary according to physical characteristics and according to the structures. (Florence, *et-al*, 2012). Following ingestion of the tissue cyst or oocyst form by humans, gastric digestive juices disrupt their outer cyst wall releasing infective forms, bradyzoites and sporozoites which rapidly invade intestinal enteroepithelial cells. They transform to active and replicate form of tachyzoites and infect adjacent cells to reach the lymphatic and blood stream. Organisms infect all nucleated cells and further invade brain, eye, heart and skeletal muscle and fat tissues as well as the placenta and fetal tissue to result congenital infection. Oral gavage of cysts containing bradyzoites resulted in inconsistent prototype for dissemination. Luciferase-derived *in vivo* signal imaging indicates significant numbers of tachyzoites are first observed in chest area and later signal spread to other organs and abdominal area. In contrast, mice infected via direct ingestion of infected organs, the signals from organisms are first detected replicating in the abdominal area. Tachyzoites trigger a strong immune response responsible for the clinical symptoms of toxoplasmosis during the acute or reactivation of the latent infection. In immunocompetent individuals free tachyzoites provoke a strong immune system and are killed by serial activation of complement associated antibodies, reactive oxygen and nitrogen radicals, osmotic fluctuations, and intracellular acidification. Humoral immune responses, IgG, IgM, and IgA are responsible for lysing extracellular tachyzoites. However, some tachyzoites attach cells and invade intracellular milieu and parasitophorous vacuole to avoid the innate and adaptive immune mechanisms. These tachyzoites transform into bradyzoites with distinct structure and slower metabolism which replicate to form the resistant tissue cysts. Tissue cysts primarily form in muscles, heart, brain, and retina, are responsible for the chronic infection.

(Helieh, *et al*, 2014). *Toxoplasmosis* can be categorized into acquired in the immunocompetent patient and acquired or reactivated in the immunodeficient patient; ocular; and congenital. Diagnosis and treatment may be different for each according to clinical category. Immunocompetent patient is generally an asymptomatic infection. However, 10%–20% of patients with acute infection may develop cervical lymphadenopathy or a flu-like illness. The clinical course is benign and self-limited; symptoms usually resolve within weeks to months. Recent data have suggested an association between *T gondii* infection and various neurologic or psychiatric syndromes, including schizophrenia, Alzheimer disease, and even suicide. These findings are intriguing but require further study to validate. Immunodeficient patients often have central nervous system (CNS) disease but may have myocarditis or pneumonitis. In patients with acquired immune deficiency syndrome, toxoplasmic encephalitis is the most common cause of intracerebral mass lesions and is thought to be due to reactivation of chronic infection. Toxoplasmosis in patients being treated with immunosuppressive drugs may be due to either newly acquired or reactivated latent infection. An important cause of chorioretinitis in the United States, may be the result of congenital or acquired infection. Congenitally infected patients can be asymptomatic until the second or third decade of life, when lesions develop in the eye presumably due to cyst rupture and subsequent release of tachyzoites and bradyzoites. Chorioretinitis is more often bilateral (30%–80%) in congenitally infected individuals than in individuals with acute acquired *T gondii* infection. Further defining the interaction of human

immunity, timing of infection, and parasite genotype is an important area of ongoing research in understanding ocular toxoplasmosis. Has a wide spectrum of clinical manifestations, but it is subclinical in approximately 75% of infected newborns. The severity of clinical disease in congenitally infected infants is related inversely to the gestational age at the time of primary maternal infection—with first-trimester maternal infection leading to more severe manifestations. When clinically apparent, it may mimic other diseases of the newborn. In a proportion of cases, spontaneous abortion, prematurity, or stillbirth may result. Involvement of the CNS is a hallmark of congenital *Toxoplasma* infection. The presence of chorioretinitis, intracranial calcifications, and hydrocephalus is considered the classic triad of congenital toxoplasmosis. Fever, hydrocephalus or microcephaly, hepatosplenomegaly, jaundice, convulsions, chorioretinitis (often bilateral), cerebral calcifications, and abnormal cerebrospinal fluid are the classic features of severe congenital toxoplasmosis. Other occasional findings included rash (maculopapular, petechial, or both), myocarditis, pneumonitis and respiratory distress, hearing defects, an erythroblastosis-like picture, thrombocytopenia, lymphocytosis, monocytosis, and nephrotic syndrome. Some infected children without overt disease as neonates may escape serious sequelae of the infection; however, a significant number (14 to 85%) develop chorioretinitis, strabismus, blindness, hydrocephalus or microcephaly, cerebral calcifications, developmental delay, epilepsy, or deafness months or years later (Helieh, *et-al*, 2014). The severity of fetal disease varies inversely with the gestational age at which maternal infection occurs. Without toxoplasma-specific chemotherapy, most foetuses infected early in pregnancy die in utero or in the neonatal period, or have severe neurologic and ophthalmologic disease. Nearly all fetuses infected in the second and third trimesters have mild or subclinical disease in the newborn. The principal clinical findings for infants and children who had symptomatic infection invariably had some degree of central nervous system (CNS) involvement and often had significant retinal disease. Approximately two thirds of them had disease primarily limited to the CNS and eyes; one third had more generalized findings. Infants who had primary neurologic disease typically had intracranial calcifications, abnormal cerebrospinal fluid (CSF) profiles, chorioretinitis, and convulsions. Infants who had signs/symptoms of generalized disease had hepatosplenomegaly, lymphadenopathy, hyperbilirubinaemia, and anaemia in addition to CSF abnormalities and chorioretinitis (Oyibo, *et-al.*, 2009). Approximately 225,000 cases of toxoplasmosis are reported each year, resulting in 5000 hospitalizations and 750 deaths, making *T. gondii* the third most common cause of lethal foodborne disease in the United States (Murat, *et-al.*, 2015). Toxoplasmosis is the third leading infectious cause of food-borne death, after salmonellosis and listeriosis. Seroprevalence varies considerably with high seroprevalence (> 50%) occurring in countries where raw meat is commonly eaten (France, 54%) and in tropical regions of Latin America or Sub-Saharan Africa where cats are numerous and the climate is favourable to oocyst survival. In the United States, 15% of childbearing age women (15 to 44) are infected with *T. gondii*, with the incidence of congenital toxoplasmosis estimated at 400 to 4000 cases per year. In Canada, only a few serologic surveys or prospective studies of women of childbearing age have been carried out (Jones, *et-al.*, 2001) On the basis of these studies, Carter and Frank have extrapolated a seroprevalence between 20% and 40% for Canadian women of childbearing age. However, their conclusion was based on studies with many important biases. High seroprevalence (59.8%) is documented in Inuit populations of Nunavik and other northern communities, associated with drinking contaminated water and consuming raw or undercooked seal meat and wild fowl. The 3 main routes of transmission

are ingestion of raw or undercooked meats, exposure to oocyst-infected cat feces, and vertical transmission (Jones, *et-al*, .2001). In pregnancy, the most common mechanisms of acquiring infection are through consuming raw or very undercooked meats or contaminated water, or exposure to soil (gardening without gloves) or cat litter. Transfusion or organ transplantation from an infected person can also transmit the organism (Cook,*et-al.*,2000). Data from a European multicentre case-control study show that raw or undercooked meat accounts for more than 30% to 63 % of *T. gondii* seroconversions during pregnancy. Similar results (60%) were observed in the United States. Several studies have shown that owning a cat poses little risk for human infection. A study of 24 106 cats in European countries reported a detection rate of *T. gondii* oocysts of 0.11%. The risk of infection from cats is related to exposure to feces from a cat that is shedding oocysts. Indoor cats that do not hunt and are not fed raw meat are unlikely to acquire *T. gondii* infection. Prevalence rates vary according to geographic location, and pregnant women who travel to areas with higher prevalence rates may be at increased risk of infection (Cook, *et-al.*, 2000). In many populations, such as those in El Salvador and France, the seropositivity rate to *T gondii* is as high as 75% by the fourth decade of life. As many as 90% of adults in Paris are seropositive. Approximately 50% of the adult population in Germany is infected. Women of childbearing age in much of Western Europe, Africa, and South and Central America have seroprevalence rates of greater than 50%. Based on serologic studies, estimates suggest the incidence of primary maternal *T.gondii* infection during pregnancy ranges from about 1-310 cases per 10,000 pregnancies in different populations in Europe, Asia, Australia, and the Americas. The incidence of prenatal *T gondii* infection within the same or similar populations has been estimated to range from about 1-120 cases per 10,000 births (Murat, *et-al.*, 2015). *Toxoplasma* infection is a serious health risk issue for the fetus and immuno compromised patients. Therefore, rapid and accurate diagnostic measures are required for possible preventions and available therapeutic modalities. *Toxoplasma* infection and toxoplasmosis can be confirmed by the use of various methodologies including serological tests, polymerase chain reaction (PCR), and histological exams, as well as isolating the organisms and imaging analysis.

## MATERIAL AND METHODS

Tendalty hospital located in Tendalty town which it one of the localities of White Nile State surrounded by kosti town from the East, El Dweim town from North, Elsalam town from the south and North Kordofan from the West. A cross sectional hospital base study was conducted to determine the prevalence of toxoplasmosis among pregnant women at Tandalty hospital, White Nile State, Sudan, 2015-2016. The study was carried out in gynecological ward at Tandalty Hospital, the pregnant women selected randomly. Inclusion criteria: Pregnant women attending to tandalty Hospital for delivery in the time of visit and Pregnant women in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> trimesters. Exclusion criteria: Non pregnant women attending to Tandalty Hospital, Pregnant women under treatment of toxoplasmosis and Pregnant women absent at the time of visit. At the study area fifty pregnant women were selected and blood sample were collected from selected pregnant women, information was collected regarding individual number, date of collection, name, age, education level, address, clinical information of fever, rash, inflammation of eye pneumonia, abortion, still birth, child blindness, child mental retardation and risk factor of disease: history of miscarriage, congenital defect history, contact with cat eating raw or under cooked meat and drinking infiltrated water. Questionnaire was constructed and explained to the

pregnant women in Arabic. At the duration of samples collection, the numbers of pregnant women attended to the tandalty hospital were 50 pregnant women. Fresh serum sample was obtained by centrifugation of clotted blood. The sample were examined directly (fresh serum) or stored between (2-8) for 48hr before performing the test. For longer period of time the serum sample must be frozen. Before use ,the kits component were allowed to reach room temperture,then the reagent r1 Toxoplasma latex was gently shaken, to disperse the latex particles and the reagent was checked against the positive control. about 20 $\mu$ l of the serum sample was placed into the center of slide, to it 50 $\mu$ l of the reagent one was added and the two drops were mixed and spread over the full surface of the circle then the slide rotated for 3minute and the result was read. homogenous appearance interpreted as the absent of Toxoplasma antibody or titrate lower than 41 $\mu$ /ml while a clear agglutination interpreted as present of Toxoplasma antibody which may reflect either a past infection or evolving Toxoplasma infection (Jacob, 1973; Desmonts, *et-al*,. 1974; Desmonts, 1975).

## RESULTS

Out of 104 samples of serum collected from pregnant women in Tendalty hospital and screened for toxoplasmosis by using latex agglutination test, the number of positive cases was found to be 40(38.5%) Table (1).

**Table 1. The number and percentage of positive and negative cases: Toxoplasmosis.**

Number of women	Positive	Negative
104	40(38.5%)	64(61.5%)

### History of abortion

Abortion was reported in 40 cases including 16(40%) of positive case; Table (2).

**Table 2. the number and percentage of positive case correlated with a history of abortion**

Number of positive case	History of abortion	Without abortion
40	16(40%)	24(60%)

### History of fever

Fever was reported in 40 cases including 30(75%) of positive case; table (3).

**Table 3. The number and percentage of positive case correlated with a history of fever.**

Number of of positive case	History of fever	Without fever
40	30(75%)	10(25%)

### History of contact with cat

Pregnant women have contact with cat in 40 case including 28 (70%) of positive case; table (4)

**Table 4. The number and percentage of positive case correlated with contact with cat.**

Number of of positive case	Contact with cat	Without contact
40	28(70%)	12(30%)

### History of abortion trimester

Trimester of abortion was reported in 16 cases including 8 (50%) of first trimester, 6 (37.5%) of second trimester and 2 (12.5%) of third trimester of positive case; table (5).

**Table 5. The number and percentage of positive case correlated with a history of abortion trimester.**

Number of of positive case	First trimester	Second trimester	Third trimester
16	8(50%)	6(37.5%)	2(12.5%)

### DISCUSSION

104 serum samples collected from pregnant women came to Tendalty hospital to detect toxoplasmosis using latex agglutination test were showed in table (1) high prevalence of Toxoplasma antibody among pregnant women due to increase age, ingestion of oocyst or eating under cooked meat, The result is in agreement with finding of Musa, *et-al* (2014) Who found that 52 (34.7%) of 150 pregnant women attended to Rabak teaching hospital were infected with toxoplasmosis. While Mohammed and Mohammed, 2013) detected 48 (56.5%) positive cases out of 85 pregnant women attended to Kosti teaching hospital. these finding were agreement with the result obtained in this dissertation. The greater number of parasite was detected in women without history of abortion table (2). The result agreement with Musa, *et-al*, 2014) who report that 40.4% in their dissertation in Rabak city and contrast with Mohammed and Mohammed, 2013 they report 58.3 have a history of abortion in their study in Kosti city. As a history of fever, the parasite is higher among those have a history of fever; Table (3). The result is in agreement with that obtained by Mohammed and Mohammed, 2013). According to history of direct contact with cats, the greatest number of parasite were detected in individual who had no such history; Table (4).this may be due to transmission of the parasite through the other route, the result is in agreement with Bukhary, *et-al* (2015) who found 65.6% of infected women in contact with cats. The present study found that abortion in first trimester is more than in second and third trimester; Table (5). This may be due to the reduced immunity during pregnancy and malnutrition at the early stages of pregnancy.

### CONCLUSION

The overall prevalence of toxoplasmosis in this study was 34.5%. According to abortion and fever, the prevalence was found to be 40.4% and 75% respectively. The prevalence among women has direct contact with cats was found to be 70%. The prevalence was higher among women aborted in first trimester and was found to be 50%.

### RECOMMENDATIONS

Further epidemiological study should be done to correlate abortion and fever to toxoplasmosis. The risk of infection with toxoplasmosis can be reduced by controlling the number of stray domestic cat and avoiding the contamination of hand, food and water with cat feces.

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