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Seroprevalence of Toxoplasma Gondii Infection among Pregnant Women in River Nile State, Sudan, from April to June 2017

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Abstract- *Background:* Toxoplasmosis is worldwide distribution disease, about 20% to 90% of the adult population in the world are reported with toxoplasmosis.

Objectives: To know the prevalence of toxoplasmosis among selected group of pregnant women from Atbara and Aldamer towns, River Nile State ,Sudan by applying Latex agglutination and ELISA serological methods and to compare between these two serological methods

Methodology: Blood specimen were collected from 50 pregnant women participated in this studies and then specimens were processed and examined by Latex agglutination and ELISA.

Result: 24% were seropositive and 76% were seronegative, 24% positive with latex agglutination and 18% positive with ELISA.

Discussion, conclusion and recommendations: ELISA is more specific than latex agglutination method, further studies are required with large sample size and more diagnostic methods.

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I. Introduction

Toxoplasmosis is worldwide distribution disease, about 20% to 90% of the adult population in the world are reported with toxoplasmosis[1].

It is third leading infections cause of food–borne death after salmonellosis and listerosis.

In Sudan first report of human toxoplasmosis was dated back to 1996 with different prevalence rates[2]

Toxoplasma gondii is an obligate intracellular protozoan parasite that infects most species of warm blooded animals including humans and causing toxoplasmosis [3]

a) Morphology

During different period of its life cycle,individual parasites convert into various cellular stages with each stage characterized by a distinct cellular morphology.

This stages include tachyzoites, merozoites, bradyzoites and sporozoites.

b) Life cycle

The life cycle of T.gondii can be broadly summarized into two components, sexual part that occur only within cats.

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The second part isasexual, it is occur within virtually all warm blooded animals include humans, cats and birds [4]. because T.gondii can sexually reproduce only within cats, they are called definitive host and other hosts in asexual reproduction are defined as intermediate hosts.

c) Sexual reproduction

When the cat is infected with T.gondii (example by consuming on infected mouse carrying the parasites tissue cyst), the parasite survive passage through the stomach, eventually infecting epithelial cell of the cat's small intestine.[4]

Inside their intestine cells the parasite undergo sexual development and reproduction, producing millions of thick walled zygote containing cyst called as oocyst.

Epithelial cells rupture and release oocysts into intestine's lumen, then shed in cat's feces. Oocysts can spread to soil, water, food and it can survive and remain infective for many months in cold dry climate [5], Ingestion ofoocysts by human or other warm-blooded animals is one of the common routes of infection. [6]

Other infected stages are tachyzoites of rapid division, and bradyzoites of slow division within tissue cysts, Tissue cysts in brain and muscle tissue formabout 7-10 days after initial infection.[7]

d) Asexual reproduction

Inside host cells the tachyzoites replicate inside specialized vacuoles called parasitophorus vacuoles, and multiply inside it until host cells dye and rupture releasing and spreading the tachyzoites via blood stream to all organs and tissues including brain. tachyzoites convert into any organ.

e) Modes of transmission

- Ingestion of undercooked, contaminated meat with infective stage of T.gondii.
- Drinking water contaminated with T.gondii or contact with contaminated soil.
- Accidently swallowing the parasite through contact with cat's feces that contain toxoplasma.
- Vertical (Transplacental) transmission.
- Organs transplantation.
- Sexual transmission.
- Inhalation of infective stage.

f) Symptoms

Most people of toxoplasmosis are asymptomatic, some of them may feel as they have flu especial pregnant women with low fever, malaise, lymph adenopathy, muscle aches and pains for month or more.

Severe toxoplasmosis causing damage to the brain lead to encephalitis and damage in eye and other organs .most severe cases are individuals who have weak immune system.

Infant who are infected while still in womb have no symptoms at birth, but they may develop symptoms later in life.

II. Stages Toxoplasmosis Infection

a) Chronic stage

Tissue cysts can be maintained in host tissue for the life time of the animal. However the presence of cysts appear to be due to periodic process of cyst rupturing and re encysting rather than a perpetual life span of individual cysts or bradyzoites.[8]

It can passed between intermediate hosts via cycle of consumption of tissue cyst in meat, however parasite's life cycle begins and completes only when passed to host.

b) Acute stage

Infection of T.gondii during third trimester of pregnancy have high risk of congenital transmission, it causing severe damage to the fetus or abortion. Also can cause manifestation such as hydrocephalus, cerebral calcification and chorioretinitisin the new born.[9, 10]

c) Diagnosis

T.gondii infection can be identified with serologic testing or aminocentesis or presence of abnormal ultra sound findings.

Several serological tests are available for detection of T.gondii antibodies such as Sabin field man dye test, Indirect Immune fluorescent test "IFAT", Modified agglutination test "MAT", latex agglutination test and Enzyme –linked Immuno sorbent assay "ELISA".

Serologic testing is the first step in diagnosis by using IgG and IgM antibodies ,the diagnostic challenge is differentiating between primary and chronic infection and result of IgG and IgM testing can often be difficult to interpret, for this reason it is important to consult with an expert area when confirming the diagnosis.

The presence of IgM cannot be considered reliable for making diagnosis for acute toxoplasmosis infection, its titer rise from five day to week following acute infection and reaching maximum after one to two months and decline rapidly than IgG.[11] Also IgM antibodies can decrease to low or undetectable levels in many cases.

IgG antibodies appear later than IgM and are usually detectable within one to two weeks after infection, with peak reached within 12 weeks to 6 months after acute infection, but it will be detectable for years after acquired infection and usually present thorough life.[12]

- If IgG and IgM are both negative this indicate the absence of infection or extremely recent acute infection. [13]
- If testing reveals positive IgG and negative IgMit indicates an old infection (more than one year ago).
- If both IgG and IgM are positive this indicates either a recent infection or false positive test result.[12]

If acute infection is suspected repeat testing is recommended within two or three weeks [11, 12], rise in IgG antibodies titers between tests indicates a recent infection.[14]

There for when positive result is appear, it should confirm by confirming test such as ELISA, Sabin Feldman test and IFAT [11, 12].

Knowing when infection occurred during pregnancy is very important in evaluating the risk of fatal transmission, so initial antibiotic therapy and ensure appropriate prenatal counseling [13].

d) Justification

Seroprevalence of *T.gondii* infection particularly in pregnantwomen, are still in conclusive. In River Nile State has no published studies on the seroprevalence of *T.gondii* infection among pregnant women and this were motivated us to carry out this study to determine the seroprevalence of *T.gondii* infection among pregnant women in Atbara and ALdamer.

e) Objectives

i. *General objectives*

To determine the prevalence of *T.gondii* infection among pregnant women in Atbara & ALdamer - River Nile state.

ii. *Specific objectives*

- To detect the presence of *T.gondii* antibodies (IgG,IgM) among pregnant women.
- To comparison betweenexposure to the risk factor and acquiring of T.gondii infection.
- To know the age of infected pregnant woman.
- To comparison between Latex agglutination test and ELISA test for diagnosis infection.

III. Material and Methods

a) Study design

This study was Cross sectional study.

b) Study area

The study performed in ALdamer & Atbara Towns, River Nile state.

c) Study period

From April to June 2017.

d) Study population

Pregnant womenfrom 18to 40 years old.

e) Inclusion Criteria

- Pregnant women were enrolled certified that to be medically fit by the specialist physician and from Atbara and ALdamer Towns.
- Age between 18-40 years.
- Didn't Received blood.
- Didn't Received organ.

f) Exclusion criteria

- Doesn't pregnant women.
- Pregnant women out of Range (18_40) years old.
- Received blood.
- Received organ.

g) Sample size

A total of 50 blood samples were drawn from pregnant women who come to Atbara and ALdamer Hospitals. This figure was arrived at using the relation

$$N = \frac{Z^2\, XP(1-P)}{ERROR^2}$$

Where

N= Sample size, Constant set by convention
Z= 1.96,
P= Previous study's prevalence.
P = 92.5% (0.996). Error was calculated at 5% (0.05).
N= [1.962 X 0.996X (1-0.996)]/0.052

And Questionnaires were administered, completed and returned for analysis.

h) Sample Collection

The blood samples were collected by venipuncture using 5 ml syringe into plain containers.

i) Sample processing

Serum obtained by centrifugation of the blood at 5000 rpm for 10 minute. Detection by Latex Agglutination test. Then +ve Result Confirmation by ELISA Test.

Firstly sample diagnosed with latex agglutination test then confirm with ELISA. Total of 50 pregnant women were enroll in this test from Atbara hospital, data collect by medical field. Take about 5 ml of venous blood by disposable syringes under sterile aseptic technique 2.5 ml in plain tube for latex agglutination test and 2.5 ml also in plain tube for confirming + ve result by detecting IgM and IgG Abs of *T.gondii*.

j) Principle of latex agglutination test

Latex agglutination is observed when sample containing the specific antigen (or antibody) is mixed with an antibody (or antigen). Which is coated in the surface of latex particles.

The reaction between aparticular antigen and an antibody results in visible clumping called agglutination.

k) Principle of ELISA Test

Enzyme Linked Immunosorbent Assay Combine the specificity of antibodies with the sensitivity of simple enzyme assays, by using antibodies or antigens coupled to an easily assayed enzyme. ELISAs can be provide useful measurement of antigen or antibody concentration.

l) Study variables

- Presence of cats in the house
- History of abortion in family
- History of delivery
- Type of Delivery
- Educational level
- Raw meat and vegetable habit
- gestational period
- blood and organ transfusion
- Nature of home ground surface.

m) Ethical consideration

- Approval from EAEUEC (Elsheikh Abdallah Albadri University Ethical Committee)
- The purpose and procedures involved in this study were explained and written inform consent were obtained from all participants. Blood were collected with the consent of the volunteers

n) Data analysis

Statistical analysis of data was done by using Statistical package for social science (SPSS).

IV. Result

Out of 50 samples of serum collected from pregnant women in Atbara and ALdamer Hospitals and screened by using latex agglutination test, the number of positive cases was found to be (22.2%) Table (1)

Table 1: The number and percentage of positive cases of toxoplasmosis

Sample size	Positive	Negative
50	12(24%)	38(76%)

Table 2: Prevalence T. gondii antibodies(IgG & IgM) among pregnant women

IgG	frequency	Percentage%
positive	12	24%
Negative	38	76%
IgM		
positive	9	18%
Negative	41	82%

Table 3: Age of participants

Age	frequency	Percentage
18-20	13	26%
21-30	24	48%
331-40	13	26%

Table 4: Comparison between age and infection with toxoplasmosis

Age group/years	Positive	Negative
18-20	5	8
21-30	4	20
31-40	3	10

Table 5: Comparison between latex agglutination test and ELISA test IgG & IgM

Toxoplasmosis latex agglutination	ELISA IgG test	
	Positive	Negative
Positive	12	0
Negative	0	38
Toxoplasmosis latex agglutination	ELISA IgM test	
	Positive	Negative
Positive	9	3
Negative	0	38

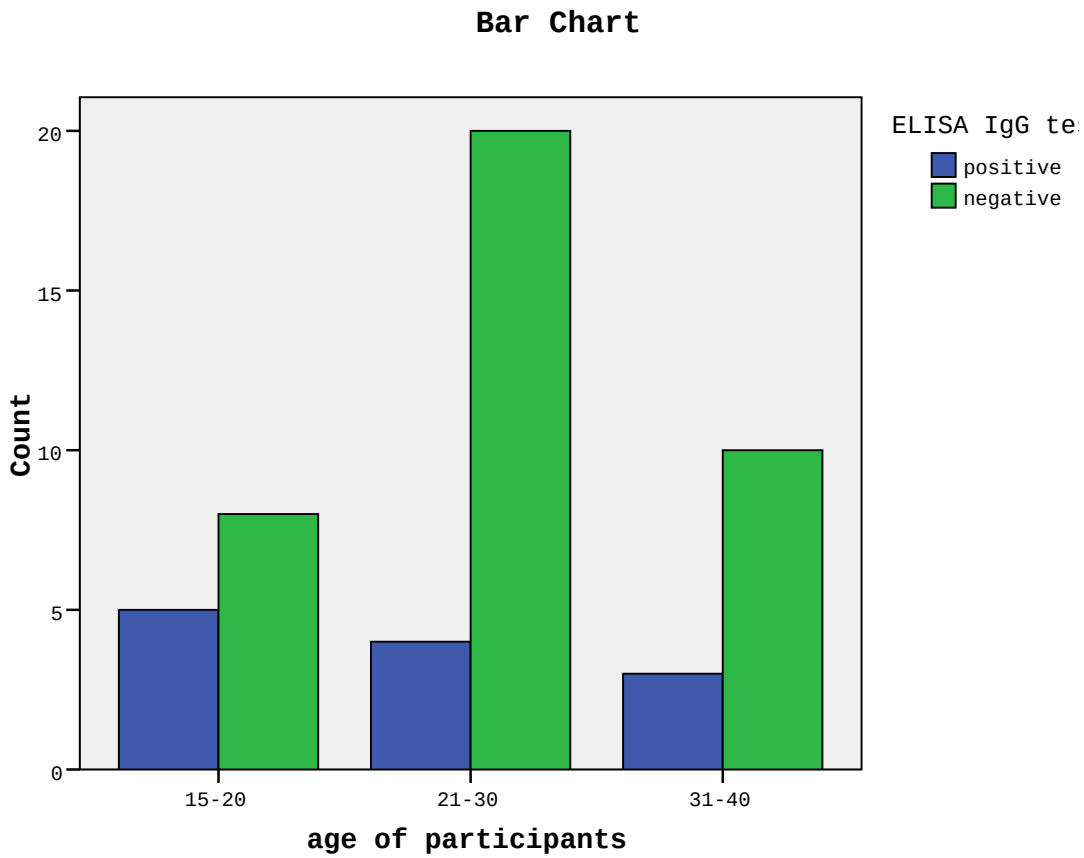

Figure 1: T. gondii IgG seroprevalence by age

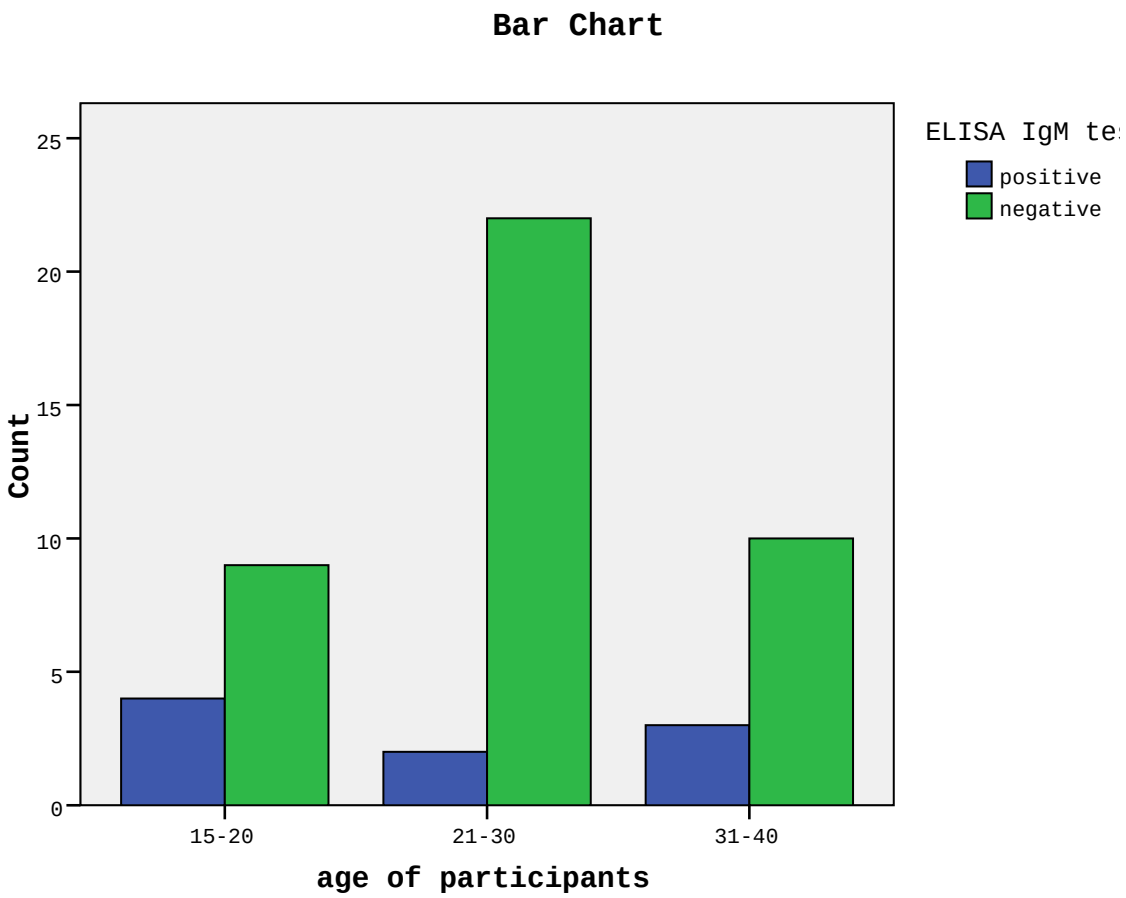

Figure 2: T. gondii IgM seroprevalence by age

V. Discussion, Conclusion and Recommendations

The current study is one of the few studies carried out to explore the seroprevalence of T. gondii infection among pregnant women in ALdamer and Atbara Towns and further studies are required with large sample size and various diagnostic methods.

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