

SEROPREVALENCE OF TOXOPLASMOSIS IN WOMEN IN MYMENSINGH AND RANGPUR IN BANGLADESH: A HOSPITAL SURVEY

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ABSTRACT

Toxoplasmosis is a great zoonotic threat that affects human species specially women. It has got major health significance because it causes abortion in pregnant women. The aim of this study was to determine seroprevalence of toxoplasmosis in women in Mymensingh and Rangpur in Bangladesh and to identify possible risk factors associated with toxoplasmosis. In this study, 87 women of 15 to 45 years old were included. Among 87 women, 74.7% (n = 65) were seronegative and 25.3% were (n=22) seropositive for *T. gondii* IgG and IgM antibodies. However, seroprevalence was higher in women aged between 31-45years. Relationship between *T.gondii* antibody and pregnancy was found significant (p<0.05). This study also reveals that pregnant women are more susceptible to toxoplasmosis than non-pregnant women. Thusly, regular screening test for toxoplasmosis is necessary for pregnant women in Bangladesh.

Keywords: Seroprevalance, toxoplasmosis, women, pregnancy.

INTRODUCTION

Toxoplasmosis, a protozoan zoonosis of global significance, is caused by an obligate intracellular protozoan parasite, *Toxoplasma gondii* that affects a wide range of hosts and results into high morbidity and mortality (Dubey, 2010). About a third of the world's human population is estimated to carry *Toxoplasma* parasite (Ryan and Ray, 2004). Probably all warm-blooded animals including most livestock and humans act as intermediate hosts whereas felines (such as domestic cat) act as definitive hosts. The life cycle of *T. gondii* includes asexual multiplication in various tissues of intermediate hosts and sexual reproduction in the intestine of definitive hosts (Hill and Dubey, 2002).

Congenital toxoplasmosis generally occurs when a woman is newly infected with *T. gondii* during pregnancy. In addition, in immunosuppressed women reactivation of an infection acquired before pregnancy can lead to congenital toxoplasmosis (Dubey, 2010). There is a 20–50% chance of transmitting *T. gondii* to the foetus during pregnancy (Mombro *et al.*, 2003). Several studies have also suggested that latent toxoplasmosis has detrimental neurological and behavioural effects on humans (McAllister, 2005).

Seroprevalence of toxoplasmosis in human populations varies greatly among countries. Studies during the last three decades have found a wide range of *T. gondii* antibody occurrence in human populations from 0% to 100% (Tenteret *et al.* 2000). In Bangladesh, a sero-epidemiological study on toxoplasmosis was performed several times and the seroprevalence varies from 11.18% (Samad *et al.*, 1997) to 38.5% (Ashrafunnessa *et al.*, 1998) among pregnant women. Also, Ashrafunnessa *et al.* (1998) reported that seroprevalence gradually increased with age and parity.

Numerous serological procedures are available for the detection of IgG and IgM antibodies including Sabin–Feldman dye test (DT), indirect haemagglutination assay (IHA), indirect fluorescent antibody assay (IFA), modified agglutination test (MAT), latex agglutination test (LAT), enzyme-linked immunosorbent assay (ELISA), and complement fixation test (CFT) (Pal, 2007). Of these, IFA, ELISA, and MAT have been modified to detect IgM antibodies (Dubey, 2010). The aim of this study was, therefore, to determine the seroprevalence and risk factors of *T. gondii* in women of Mymensingh and Rangpur district, Bangladesh.

MATERIALS AND METHODS

The study was conducted in Sadar upazilas of Mymensingh and Rangpur district during January to May 2015. The samples were collected from the women who visited the diagnostic centers for pathological test in Mymensingh and BRAC clinic in Rangpur. A total of 87 blood samples were collected from women aged

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between four groups as 15- 20 years, 21-30 years, 31-45 years and >45 years, who attended for the treatment of gyno-obstetrics problem. Forty seven blood samples were collected from Rangpur and forty from Mymensingh. Relevant data like age of the patient, pregnancy status (pregnant or non-pregnant) were collected and recorded sincerely from the register book of those diagnostic centers and clinics. All data gathered was converted to information, compiled and tabulated as per objectives of the study.

Blood specimens from the women were collected into a lavender top collection tube (containing EDTA) and transported to the laboratory of the Department of Parasitology, Bangladesh Agricultural University, Mymensingh. At the laboratory, the serum was separated by centrifugation (2000 rpm) at 4°C for 10 minutes and tested for *T. gondii* specific antibodies using a commercial kit (On Site Toxo IgG/IgM Combo Rapid Test, CTK® Biotech. Inc. USA, R0234C) according to manufacturer’s instructions.

Statistical analyses were performed using statistical software package SPSS version 22. Statistical significance was defined as $p < 0.05$.

RESULTS AND DISCUSSION

In the present study, a total of 87 women were included; among them 47 were from Rangpur and 40 were from Mymensingh. Twenty two (25.3%) samples were seropositive and sixty five (74.7%) were seronegative (Table 1). No significant association ($p > 0.05$) was found in seroprevalence between Mymensingh and Rangpur districts, Bangladesh (Table 1). Seroprevalence of toxoplasmosis was higher in 31-45 years (30.2%) than 21-30 years (23.8%), 15-20 years (22.2%) and >45 years (14.3%). The effect of different age group on the seroprevalence of toxoplasmosis was not significant ($p > 0.05$) (Table 2). The seroprevalence of toxoplasmosis was higher in pregnant women (39.1%) than non-pregnant women (9.8%). Pregnant woman is six times more prone to toxoplasmosis than non-pregnant and their relationship was statistically significant ($p \leq 0.05$) (Table 3).

Table 1. Seroprevalence of toxoplasmosis in two study areas

Place	Tested	Positive	Prevalence (%)	Odds ratio	Chi-square value	P value
Rangpur	47	15	31.9	2.2	1.67	0.09 NS
Mymensingh	40	7	17.5			
Total	87	22	25.3			

NS= Not significant ($p > 0.05$)

Table 2. Seroprevalence of toxoplasmosis in relation to age of women

Age(yrs)	Sera Tested	Positive sera		Total Positive	Prevalence (%)	Chi-square value	P value
		IgG	IgM				
15-20	9	1	1	2	22.2	1.52	0.74NS
21-30	21	4	1	5	23.8		
31-45	43	10	3	13	30.2		
>45	14	1	1	2	14.3		
Total	87	16	6	22	25.3		

NS= Not Significant ($p > 0.05$)

Although toxoplasmosis is considered harmless for non-pregnant women, it is potentially harmful during pregnancy, especially at the first trimester (Giannoulis *et al.*, 2008). Seroprevalence of *T. gondii* varies in different regions of the world (Mandel, 2010). According to Pappas *et al.* (2009) the seroprevalence in women of child-bearing age in USA, Brazil, Argentina and Colombia was 11.0%, 7.3–77.5%, 48.7–53.4%, and 47.0–63.5%, respectively, while in Europe it varied between 8.2% (in Switzerland) and 63.2% (in Western Pomerania, Germany). In Asia and Oceania, the seroprevalence ranged from 0.8% (Suwon region, South Korea) to 63.9% (Babol, Iran) and in Africa, it was between 25.3% (Burkina Faso) and 75.2% (Sao Tome and Principe) (Pappas *et al.*, 2009).

In the present study, the seropositivity for anti *T.gondii* IgG & IgM was 18.4% (16/87) and 6.9% (6/87) respectively whereas 74.7% (65/87) was seronegative. The combined seropositivity for anti *T. gondii* IgG and IgM was found to be 25.3% (22/87) using Toxo Combo Rapid Test kit. Similar findings were reported by many other scientists in Bangladesh and abroad. Asrafunnessa *et al.* (1998) reported 110 positive cases of women in Bangladesh carrying IgG antibody among 286 patients and seropositivity was 38.5%. In Iran, Yad *et al.* (2014)

performed a prevalence study among pregnant women and found 27.3% positive cases for toxoplasmosis. Slightly lower IgG rate (15.89%) was observed by Samad *et al.* (1993) during experiment among women of Bangladesh with different gyno-obstetrical diseases. Very low rate of toxoplasmosis seropositivity (3.7%) was observed by Han *et al.* (2008) in Korea, who investigated 351 serum samples of pregnant women for anti-*T. gondii* antibody.

The present study demonstrated a non-significant association between toxoplasmosis and different age groups of women that may be due to small sample size. This finding is in line with the data obtained from study in Saudi Arabia (Al-Qurashi *et al.*, 2001) and in Nigeria (Nasir *et al.*, 2015). The percentage of seropositivity of toxoplasmosis demonstrated a gradual increase with advancing age of the mother, and the percentage was the highest (30.2%) among women of age-group of 31-45 years in our study (Table 2). This is supported by findings from Yad *et al.* (2014) who reported the highest prevalence (44%) among 36-40 year age group and Sarkar *et al.* (2012) who found highest seropositivity among women of >30 years in Andhra Pradesh, India. Spalding *et al.* (2005) also observed a higher prevalence among people aged 20-30 years, and the prevalence of infection was increasing with older age-group. Mittal *et al.* (1995) opined that the seropositivity of *Toxoplasma* increases with age which is also supported by Nijem *et al.* (2009). According to their study, the lowest rate of antibody acquisition occurred in the age-group of 15-20 years. In addition, recent studies like Imam *et al.* (2016) reported 21.3% IgG seroprevalence rate among pregnant women in Almadinah. They found increased seropositivity with age; the highest rate of IgG seropositivity was in the age group 35-39 years (33.3%), while the youngest and oldest age groups had no positive cases. Similar seropositivity (27.9%) to *T. gondii* among pregnant women has been observed by Nijem *et al.* (2009). On the other hand Nasir *et al.* (2015) reported highest seroprevalence of *T. gondii* IgM and IgG antibodies among women in Nigeria within the age group 21-25 years with 46 (76.7%) and 19 (5.3%), respectively. Moreover, Jones *et al.* (2001) described 22.5% overall seroprevalence in pregnant women where they found 15% seroprevalence among women aged 15-44 years.

Wam *et al.* (2016) revealed 54.5% seroprevalence of anti-*T. gondii* antibodies among the women of child-bearing age. Again, we may have obtained a different result if we considered sampling from only women of child bearing age. However, most of our study population was sampled among those who came for medical check-up at the selected hospitals.

In addition, from this study there is observed significant association between pregnancy status and toxoplasmosis seropositivity (OR= 6, $p < 0.05$) (Table 3). *Toxoplasma* antibody among pregnant women is 39.1% where woman without pregnancy is 9.8% *Toxoplasma* seropositive. Zemene *et al.* (2012) reported 83.6% (167/201) seroprevalence of *T. gondii* among the pregnant women; one hundred and sixty three (81.1%) of them were IgG seropositive and five (2.5%) of them were IgM seropositive, three of the five were positive for both IgM and IgG. A pilot study in Kumaon region of India in 2005 reported 55% for *Toxoplasma* IgG antibodies and 20% for IgM antibodies (Thapliyal *et al.*, 2005). Singh and Pandit (2004) found an overall anti-*Toxoplasma* IgG seroprevalence of 45% among pregnant women in New Delhi, India.

Table 3. Seroprevalence of toxoplasmosis in relation to pregnancy of women

Pregnancy status	Tested	Positive	Prevalence (%)	Odd ratio	Chi-square value	P value
Pregnant	46	18	39.1	6.0	8.4	**0.003
Non-pregnant	41	04	9.8			
Total	87	22	25.3			

**Significant at ($p < 0.05$)

The binding (avidity) of *T. gondii* antigen to specific antibodies can change during the course of infection. During the early (acute) stage of infection, avidity values are low and increase with duration of infection. In this test, sera are run with or without treatment with urea (or other protein denaturing agents) and the difference in titers can be used to determine the recent infection. The test can be used with IgG, IgA, and IgE antibodies using different serological procedures, most often ELISA (Dubey, 2010). The sensitivity and specificity of other calculated respectively as 72.9% and 85.9% in ELISA, 45.9% and 96.9% for LAT as well as 82.9% and 90.29% for MAT test (Dubey *et al.*, 1995).

U. H. Margia and others

In this study, seroprevalence of toxoplasmosis has been determined in women in Mymensingh and Rangpur districts of Bangladesh by using Toxo Combo Rapid Test kit. This study shows startling seropositivity among pregnant women. This high rate of infection demands the need for preventive measures such as awareness creation about toxoplasmosis; mainly education of pregnant women about the transmission and preventive methods at antenatal care clinics. Hence, further study is needed to carry out with larger sample size and other associated risk factors.

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