INNOVATIONS

Serological screening for toxoplasmosis in antenatal women in a rural teaching hospital

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Abstract

Problem: Toxoplasmosis can cause significant morbidity and mortality in the developing fetus if the pregnant mother gets acute infection during pregnancy. Early diagnosis of toxoplasmosis is essential to start appropriate treatment on time to reduce the transplacental transmission to the fetus.This study was therefore designed to determine the seroprevalence of *Toxoplasma gondii* among pregnant women attending ante-natal clinic. **Methodology**:This study was conducted in a tertiary rural teaching hospital, near Trichy, Tamil Nadu, for a period of 3 months on 100 asymptomatic antenatal women. Three (3ml) of blood sample was collected and serum was separated and stored at -40°C until analysis. The IgM and IgG antibodies were detected using the *Toxoplasma* ELISA kit. **Findings:** The antenatal women who participated in the screening study belonged to the age group of 15-40. Most of the women belong to the age group of 21-25 (46%). Nearly 78% of women did not cross graduation. (80%) of women belonged to middle or lower middle socio-economic status and (66%) of women were from urban areas. The IgM and IgGseropositivity among the study group was 4% and 9% respectively. **Conclusion:** Congenital toxoplasmosis is a preventable disease, and this study emphasizes the importance of early prenatal serological tests, and preventive measures so as to avoid fetal disease. It should be mandatory to screen every immunocompromised patient and antenatal woman for toxoplasmosis.

Key words: 1. Toxoplasma 2. Antenatal woman 3.Seropositivity

Introduction

Toxoplasmosis has been described as the most widespread zoonotic infection caused by an intracellular parasite, *Toxoplasma gondii*(Simpose*et al.,* 2006; Sensini,

2006).Although, the mortality rate of this parasite in adult is very low but it causes devastating effects including blindness, neurological impairment and mental retardation in congenitally infected children(Hill and Dubey, 2002; Ramshewak*et al.,* 2008). Toxoplasma gondii was implicated as a significant cause of fetal and neonatal mortality when acquired in-utero and an important contributor to early and later childhood morbidity.

Epidemiological studies suggest that prevalence of *T. gondii* infection in pregnant women varies substantially among different countries; in Europe it varies from 9% to 63%, 63.2% in Germany(Fiedler *et al.,* 1999), 19.8% in Italy(Masini*et al.,* 2008), and 9.1% in the UK(Nash *et al.,* 2008). In Asian countries the seroprevalence of toxoplasmosis was reported low: 3.7% in Korea and 11.2% in Vietnam(Buchy*et al.,* 2003; Borkakoty*et al.,* 2007) while prevalence is as high as 41.6% to 45% in Indian pregnant women(Borkakoty*et al.,* 2007), 66.9% in Jordan and 53.1% in Kuwait(Jumaian, 2005; Iqbal and Khalid, 2007). In the American continent, the seroprevalence of toxoplasmosis was reported to be 77.5% in Brazil (Proto *et al.,* 2008) and 63.5% in Colombia(Castro *et al.,* 2008).

Detection of recently acquired infection with Toxoplasma gondii is important in pregnant women for prevention of transmission of the infection to their fetuses. Unfortunately, till now, *Toxoplasma* is not a reportable disease in India and screening of pregnant women for this parasite is not part of the routine test carried out on antenatal women, thus, congenital abnormality cases are still being seen in the hospitals. Despite the untold hardship caused by this parasite on the children of infected pregnant women, information on the seroprevalence of this zoonotic disease is limited.

Seroprevalence and incidence of toxoplasmosis in Indian women of child bearing age has remained a contentious issue.Different laboratories have used different patient recruitment criteria, methods and variable results, making these data unreliable. This study was therefore designed to determine thesociodemographic profile and seroprevalence of *Toxoplasma gondii* among pregnant women attending ante-natal clinic.

Materials and Methods

Setting of the Study: This study was conducted in a tertiary rural teaching hospital, near Trichy, Tamil Nadu, for a period of three months.

Sample Size: Total number of samples collected was 108.

Inclusion Criteria: Antenatal women of age group between 15 and 40, both primigravida and multigravida belonging to all three trimesters of pregnancy with different socio-economic status from places in and around Tiruchirapalli. All

antenatal women were asymptomatic; antenatal women with history of previous abortions.

Exclusion Criteria: Ante -natal women with active lesions,rash, fever, lymphadenopathy and arthralgia.

This research proposal was approved by IEC. All study participants were assured about the confidentiality and anonymity and efforts were taken to ensure the privacy of the information. Informed consent was obtained from the women participating in this study. A structured proforma was used to collect a detailed history.

Methodology: Three(3ml) of blood sample was collected and serum was separated and stored at -40°C until analysis. The IgM and IgG antibodies were detected using the *Toxoplasma* ELISA kit (DSI Diagnostics). The result was interpreted as seropositive if the antibody titre was more than 10 IU/ML as per the kit insert.Simple descriptive statistics was used in this study to analyze the data.

Results and Discussion

The antenatal women who participated in the screening study belonged to the age group of 15-40. Most of the women belong to the age group of 21-25 (46.2%). Nearly 78% of women did not cross graduation. (80%) of women belonged to middle or lower middle socio-economic status and (66.6%) of women were from rural areas.According to Modified Prasad's classification, the population is divided into six social classes according to the per capita social income in rupees(Agarwal, 2008). Class 1 (10,000 and above), Class II (5000-9999), Class III (3000-4999), Class IV (1500-2999), Class V (500-1499), Class VI (<500). The detailed socio-demographic details were depicted in table 1.

Of the IgM, seropositive women (2%) were from the age group of 21 -25 years and(2%) were from the age group of 31-35years. Out of the ninety six IgMseronegative cases, 19%, 44%, 147%,8% and 8% were from 15-20, 21-25,26-30,31-35 and 36-40 years respectively (Table 2).

Out of the IgG, seropositive women (3%) were from the age group of 21 -25 years,(3%) were from the age group of 26-30years,(2%) were from 31-35years and (1%) belonged to the age group of 15-20years. Out of the ninety one sero-negative cases, 18%, 43%, 14%,8% and 8% were from 15-20, 21-25,26-30,31-35 and 36-40 years respectively (Table 3).

Of the IgM seropositive antenatal women, three women belong to ClassV and one woman belongs to Class IV.Out of nine IgGseropositives, five, three and one women belong to Class V, Class IV and Class I respectively (Table 4).

Discussion

Toxoplasmosis is one of the most common parasitic infections seen in humans. The spectrum of infection varies to asymptomatic infection in immunocompetent individuals to ocular and neurological manifestations in immunocompromised individuals. Approximately one-third of the population is exposed to this parasite while it is dangerous for mothers infected during pregnancy and infants.Toxoplasmosis is usually diagnosed by serological tests by detection of specific immunoglobulin M (IgM) and IgG antibodies. A positive IgM titer establishes recent infection whereas negative IgM result virtually rules out recently acquired infection. Acute infection with toxoplasma during pregnancy and its potentially tragic outcome for the fetus continues to occur worldwide despite the fact that it can be prevented worldwide.

In the present study 46% of women belong to the age group 21-25 years, which is comparable with other studies (Spalding *et al.,* 2005; Hung *et al.,* 2007;Malarvizhi*et al.,* 2012). But in few studies it was found that prevalence increases as the age increases, the reason might be increasing risk of exposure with age(Morris and Croxson, 2004). The frequency of infection increases with older age groups as the probability of an individual coming into contact with the transmission routes increases as his or her age increases.

The education status of a woman plays an active role in acquiring the disease.Toxoplasmosis mainly spreads through ingestion of undercooked meat and meat products, contact with pet animals like cats whose feces are infected with oocysts of toxoplasma.If the woman is educated, they would probably have an idea about the different modes of acquisition of disease and preventive measures.Seroprevalence tends to be lower in pregnant women who adopted appropriate hygienic measures regarding food and cooking habits such as washing chopping boards with soap or bleach, using separate chopping board for meats and vegetables, the frequent washing of knives and hands while cooking and avoiding cross contamination of food compared to the uneducated group belonging to lower socio economic strata(Mohammed, 2011).

In the present study the predominantly seropositives belong to socioeconomic class V and IV. This was similar to a study done in Hyderabad, which showed a higher percentage of seropositivity in women of low socio-economic group (33%) compared to those of high socio-economic group(22%) (Yasodhara*et al.,* 2004). A multivariate analysis done in the United States showed that risk of *T.gondii* infection was higher in persons with a lower educational level and those who lived in crowded places(Jeffery *et al.,* 2001).

Seroprevalence of Toxoplasmosis IgM and IgG is four and nine percent respectively.The seroprevalence of *Toxoplasma gondii* in human population varies greatly among different countries, geographical areas within the same country, and among the ethnic groups living in the same area(Hill and Dubey, 2002; Gilbert *et al.,* 1993).A study done in Nigeria (Ishaku*et al.,* 2009) reported prevalence rates to be 29.1% and 0.8% for chronic and acute infections respectively. The seroprevalence of anti-*Toxoplasma*IgG was 20% (39 out of 195), whereas IgMseropositivity was 6.2% (12 out of 195) in a study done in Saudi Arabia(Hussein *et al.,* 2014). Overall prevalence of anti-*Toxoplasma*IgG antibodies was seen at 22.4% and IgM varied between 0.4 to 2.9% in a multicentric study done in India(Sarman*et al.,* 2014).The study area being predominantly rural wherein contact with soil, farming and gardening are risk factors. It was also observed that high prevalence of *Toxoplasma* infection was seen in lower socioeconomic groups. Lack of education and knowledge about hygiene, close contact with soil and surface water which is contaminated with excreta of infected animals could be the possible reasons for seropositivity.

Conclusion

Congenital toxoplasmosis is a preventable disease, and this study emphasizes the importance of early prenatal serological tests, and preventive measures so as to avoid fetal disease. It should be mandatory to screen every immunocompromised patient and antenatal woman for toxoplasmosis, and initiation of judicious treatment on time can prevent morbidity and mortality due to toxoplasmosis(Gohel*et al.,* 2014). To estimate the real magnitude of the problem, investigative measures should be taken to undertake multicentric study as well as compulsory screening for the antenatal risk group. Increased awareness and education at the patient and public level through government and private organizations are required to reduce the *Toxoplasma* exposure and to reduce the risk of congenital transmission with respect to the various modes of spread.

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Table: 1 Socio-demographic details of the antenatal women (n=108)

Variables	**Socio-demographic details**	**Number (%)**
Age groups	15 -20 21 -25 26 -30 31 -35 36 -40	21 (19.3%) 50 (46.2%) 18 (16.5%) 11 (10.1%) 08 (7.4%)
Education Status	Illiterate Primary school Middle school High school Higher secondary Graduate Post graduate	9 (8.3%) 14 (12.9%) 22 (20.4%) 17 (15.7%) 24 (22.3%) 20 (18.6%) 02 (1.8%)
Socioeconomic Status	Class I Class II Class III Class IV Class V	07 (6.5%) 14 (12.9%) 17 (15.8%) 29 (26.8%) 35 (32.5)

	Class VI	6(5.5%)
Residence	Rural Urban	72(66.6%) 36 (33.4%)

[Figures in parenthesis denote percentage]

Table 2: **Seroprevalence of Toxoplasma IgMamong antenatal women (n=108) according to age**

Age (in years)	No. tested	ToxoplasmaIgM positivity	ToxoplasmaIgM negativity
15-20	21	-	21 (19.4%)
21-25	50	2 (1.85%)	48 (44.4%)
26-30	18	-	18 (16.6%)
31-35	11	2 (1.85%)	9 (8.3%)
36-40	8	-	8 (7.4%)
Total	108	4 (3.7%)	104 (96.3%)

[Figures in parenthesis denote percentage]

Table 3: Seroprevalence of Toxoplasma IgG among antenatal women (n=108) according to age

Age	No tested	Toxoplasma IgG positivity	Toxoplasma IgG negativity
15-20	21	1(0.9%)	20(18.5%)
21-25	50	3(2.8%)	47(43.5%0
26-30	18	3(2.8%)	15(13.9%)
31-35	11	2(1.9%)	9 (8.3%)
36-40	8	0	8(7.4%)
Total	108	9 (8.4%)	99(91.6%)

[Figures in parenthesis denote percentage]

Table 4: Distribution of Seropositivity (IgM&IgG) according to socioeconomic status

Socioeconomic status	IgMSeropositivty (N=4)	IgGSeropositivity (N=9)
Class I	-	1(11.1)
Class II	-	-
Class III	-	-
Class IV	1(25%)	3(33.3)
Class V	3 (75%)	5 (55.6%)

[Figures in parenthesis denote percentage]