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SEROPREVALENCE OF *TOXOPLASMA GONDII* IGG AND IGM ANTIBODIES IN A HEALTHY FEMALE POPULATION FROM DELHI.

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ABSTRACT

Introduction: *Toxoplasma gondii* infection can cause congenital abnormalities, and even fetal loss. In India, awareness about TORCH group of infections cause congenital conditions is poor and routine testing is not recommended by obstetricians but is recommended to those who have had an undesirable pregnancy outcome. **Aim:** To evaluate the seroprevalence of IgM and IgG antibody of toxoplasma among the healthy female population in Delhi. **Methodology:** The study was done in Lady Hardinge Medical College, New Delhi. A total of 1000 serum samples were taken over a period of two years from apparently healthy female population. 500 samples were included from healthy ANC females whose samples had come for routine VDRL screening and 500 were apparently of healthy female children 5 -15 years (Average 11) whose ASO and CRP were negative over a period of two years. All the samples were subjected to ELISA test for detection of IgM & IgG antibodies. **Results:**A total of 1000 participants consisting of ANC females and children (5-15 years), 500 each were included in the study. Out of 1000 samples tested for IgM and IgG antibodies, 766 (76.6%) were negative and 234 (23.4%) were positive

for Toxoplasma antibodies. **Conclusion:** Overall positivity rate of IgM, IgG and both were found to be 59 (5.9%), 122 (12.2%), 53 (5.3%) respectively. The positivity rate of IgM, IgG & both among adult female was 32 (6.4%), 82 (16.4%), and 32 (6.4%) respectively whereas in female children it was 27 (4.4%), 40 (8.0%), 21 (4.2%) Overall seropositivity rate of IgG antibody among children and adult was found to be statistically significant ($p < 0.05$, chi square) which indicated that incidence of toxoplasmosis increases with age. At the same time no significant difference was found in the two groups in IgM and both IgM and IgG positivity. This indicated that both children and adults are at equal risk of infection with *Toxoplasma gondii*.

KEYWORDS: *Toxoplasma gondii*, seroprevalence females, IgG, IgM, Delhi.

INTRODUCTION

Toxoplasma gondii is a ubiquitous parasite of warm blooded animals and is common etiology of congenital abnormalities, and even fetal loss.[1,2] It is estimated to have infected about a third of the world's population.[3] In India, awareness about TORCH group of infections is poor. Most women who seek medical attention, or are referred by obstetricians, are those who have had an undesirable pregnancy outcome.[4] Toxoplasmosis is most dangerous infection in immunocompromised patients and fetus whose mothers acquire acute infection during pregnancy.[3] Human infection generally occurs through the ingestion of raw or uncooked meat that contains cysts, ingestion of water or food contaminated with oocysts or congenitally through transplacental transmission from a mother infected during pregnancy.[4] Infections with *T. gondii* in humans are usually asymptomatic or in the form of mild febrile illness.[5]

The seroprevalence varies widely in different regions of the globe, measuring between 30% and 60% in most countries.[3,6,7] The prevalence changes according to social and cultural habits, geographic factors, climate and transmission route and it typically increases with age.[3, 5] It has been reported that the prevalence is higher in warm and humid area.[5, 6] In India the prevalence in general population varies from very low as 1% to very high as 57%.[8]

Routine screening for toxoplasmosis involves detection of IgM and IgG antibodies in the patients serum. In the antibody response to toxoplasma infection, IgM antibodies are detected within a few days to one week of infection and disappear generally after three to five months. The IgG antibodies are detected within one to two weeks of infection, reaching a peak after four months, then declining to lower levels and remaining positive for the remainder of the

individuals life. A negative IgM antibody test excludes acute infection while a positive IgG test with a negative IgM indicates chronic infection.[3]

Toxoplasmosis is not a reportable disease and prevalence is based on regional studies. The aim of this study is to evaluate the seroprevalence of toxoplasmosis among the healthy female population in Delhi.

MATERIAL AND METHODS

Study design: The study was done in Department of Microbiology, Lady Hardinge Medical College, New Delhi. A total of 1000 serum samples were included in this study: 500 ANC females whose samples had come for routine VDRL test (General population) and 500 from apparently healthy female children whose samples were negative for ASO and CRP were selected randomly over a period of two years. Testing was unlinked anonymous. Serum samples were subjected to ELISA to identify the presence of IgM and IgG antibodies with commercially available ELISA kit (Cal biotech) as per manufacturer guidelines.

Statistical analysis: Study data was analysed using Statistical Program for the Social Sciences (SPSS) version 16 (IBM SPSS, Chicago, III, USA) and Microsoft word and Excel were used for generation of table. Categorial variables were analysed using Chi square test, Fishers exact test were used to determine relationships and differences between variables as appropriate. For all statistical tests, *P* value of less than 0.05 was taken as indicative of statistical significance.

RESULTS

A total of 1000 participants consisting of ANC females and children (5-15 years), 500 each were included in the study. Out of 1000 samples tested for IgM and IgG antibodies, 766 (76.6%) were negative and 234 (23.4%) were positive for Toxoplasma antibodies. Overall positivity rate of IgM, IgG and both were found to be 59 (5.9%), 122 (12.2%), 53 (5.3%) respectively. The positivity rate of IgM, IgG & both among adult female was 32 (6.4%), 82 (16.4%), and 32 (6.4%) respectively whereas in female children it was 27 (4.4%), 40 (8.0%), 21 (4.2%) respectively. (Table 1)

Table 1: Results of Toxoplasma antibodies by ELISA

Samples	Only IgM Positive (%) Acute/ Recent Infection	Only IgG Positive (%) Chronic/ Latent Infection	Both IgM and IgG positive (%) Infection in recent past	Both IgM and IgG negative (%) No Infection	P value
Children	27 (4.4)	40 (8.0)	21 (4.2)	412 (82.4)	<0.05
ANC females	32 (6.4)	82(16.4)	32(6.4)	354 (70.8)	
Total	59 (5.9)	122 (12.2)	53 (5.3)	766 (76.6)	

Figures in parenthesis shows percentage.

DISCUSSION

Toxoplasmosis is a parasitic disease in which transmission of infection has been shown to be promoted by poor environmental sanitation, overcrowding, eating habits, poverty and poor hygiene[3]. The IgM antibody response to Toxoplasma infection is short lived. Demonstration of Toxoplasma specific IgM antibodies indicates recent infection. The IgG antibody response indicates the seroprevalence or the chronicity of the disease. In our study seropositivity was 23.4% for Toxoplasma antibodies of which IgM was 59 (5.9%), IgG 122 (12.2%) and both IgG and IgM 53was (5.3%) respectively.

Seroprevalence of *T. gondii* infection in humans has been used as an indicator of the endemicity of the parasite.The seroprevalence varies widely according to the geographical regions. Worldwide seroprevalence varied as shown by various workers. Dimie Ogoina *et al*, (Nigeria 2013) showed seroprevalence of IgM and IgG in healthy males as 4.6% and 28.7% respectively.[3] Studies from China and Korea reported prevalence rates of 4.86 % and 12.9 % respectively.[6,7,9]

In Europe, the highest seroprevalence has been reported from France. Lower seroprevalence has been found in North America, South- East Asia, and Oceania.[8] Studenicova *et al* (2006), in Slovakia showed the seroprevalence of IgG as 24.2%.[10]

Whereas the seroprevalence rates in the general population in India vary from a low of 1% to as high as 57 %.[8] Study done by Sarman *et al*(2014) resulted in estimated prevalence of 22.4%; the highest prevalence being in South India (37.3%) followed by East India (21.2%) and North India (19.7%).[4] Studies done in Mumbai (West India) by Dhumne *et al* (2007), showed IgG and IgM positivity rate as 24.3% and 2% respectively and Meisheri *et al*(Mumbai) showed higher seroprevalence (30.9%) in general population.[11,12] In North India

– seroprevalence rate varied from 4.7% - 19.7%.[3] The seroprevalence rate reported from urban and rural samples from Chandigarh was 4.7% while in Hospital based samples from Jodhpur in Rajasthan was 17.2%.[5,13]

Various authors have shown that the seropositivity is higher in Southern India as compared to North India.[4,5] These wide variations could be related to socio- cultural habits, geographic and environment factors, general hygiene in the society and the routes of transmission. The habit of consuming raw or undercooked meat and having pet animals specially cat is not very popular in Delhi. On the other hand climatic condition in South India are more favourable compared to Northern India for survival of Toxoplasma oocysts. These may be the reasons for higher seropositivity in South India compared to North.[15]

In females infection occurring during pregnancy can lead to congenital infection of the fetus with highest risk of transmission if the infection occurs during the first trimester. A seroprevalence study in antenatal group offer better idea of the prevalence in females in the society. Early diagnosis and treatment have an effective role in reducing the transmission of infection. In our study seroprevalence in the ANC females for IgM, IgG and both IgM and IgG antibody was 6.4%, 16.4%, and 6.4% respectively. Similar study from South India reported seroprevalence of 33% in lower socio-economic group compared to higher socio economic group as 22%. Suryamani Chintapalli (Andhra Pradesh) in her study on ANC cases found seropositivity for IgG, IgM and both IgG and IgM as 45%, 20% and 10% respectively.[14] Similarly in study done by Sarman Singh *et al* the prevalence of IgG in North India was 19.7 % whereas IgM seropositivity ranged from 0.4% to 2.9%.[4]

In our study seroprevalence seen in children was 4.4% for IgM, 8% for IgG and 4.2% for both IgM and IgG. According to Sunder *et al* seropositivity of IgM varied from 10%-13.3% in age group of 6-12 years.[8] Majority of the children are exposed to toxoplasma before 12 years of age due to poor hygiene and handling of animals. The seropositivity was found to be lower when compared to the ANC cases where positivity rate for IgM, IgG and both were 6.4%, 16.4% and 6.4% respectively.

Overall difference in the seropositivity rate of IgG antibody among children and adult was found to be statistically significant ($p < 0.05$, chi square) which indicated that incidence of toxoplasmosis increases with age. At the same time no significant difference was found in the two groups in IgM and both IgM and IgG positivity. This indicated that both children and

adults are at equal risk of infection with *Toxoplasma gondii*.Similar findings of increase in toxoplasmosis with increasing age was confirmed in studies done by Studenicova, Ogoina and Sundar *et al*.[3, 8,10]

In ANC cases early diagnosis and treatment have an effective role in reducing transmission of infection from mother to baby [4].Knowledge of disease prevention is more important in public health programs, especially to the female groups. The finding that seroprevalence of anti – *T. gondii* IgG in females is quite high is significantly important to public health.Consumption of well cooked meat and proper handling and disposal of fecal material from pet cats are important measures of disease prevention.[6,7] The study has got few limitations such as : risk factors related to Toxoplasma infection were not assessed and male healthy population was not included.

CONCLUSION

Overall difference in the seropositivity rate of IgG antibody among children and adult was found to be statistically significant ($p < 0.05$, chi square) which indicated that incidence of toxoplasmosis increases with age. At the same time no significant difference was found in the two groups in IgM and both IgM and IgG positivity. This indicated that both children and adults are at equal risk of infection with *Toxoplasma gondii*.

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