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Association in *Toxoplasma gondii* and Related Psychotic Disorders: A Primary Report

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Abstract

Background: Implication of infection in etiology of psychotic disorders is an area of interest.

Aim: We aimed to explore the relationship between *Toxoplasma gondii* and psychotic disorders in a preliminary study.

Materials and methods: *T. gondii* immunoglobulin M (IgM) and immunoglobulin G (IgG) antibodies were measured in a sample of patients with psychotic disorders, first-degree relatives (FDR), and healthy volunteers (HV) and compared. Data were analyzed by descriptive statistics in the forms of frequency and percentage using Statistical Package for the Social Sciences (SPSS).

Results: Sample size was 10. Men and women were equal. All were from rural background. One patient with psychotic disorder out of the four had anti-*T. gondii* IgG antibodies in comparison to none among the three each of the FDR and HV. The patient with positive *Toxoplasma* IgG antibody status had the diagnosis of acute and transient psychotic disorder (ATPD).

Conclusion: This pioneering pilot project from this part of the globe highlights a pertinent area for further work in the future in order to have a newer understanding in proper management of psychotic disorder.

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Conflict of interest:

Dr Samrat S bhandari is associated as the Editorial board members of this journal and this manuscript was subjected to this journal's standard review procedures, with this peer review handled independently of the Editorial board members and his research group.

Keywords

Enzyme-linked fluorescent assay; Neuropsychiatric disorders; Schizophrenia

Introduction

The role of infection in the causation of schizophrenia is gaining ground. One such infectious agent is *Toxoplasma gondii*.¹ Can we find a relation of *Toxoplasma* with schizophrenia and related disorders? Such a relation helps us not only in our knowledge of these neuropsychiatric disorders but also in their treatment. The study protocol of this work is already published.²

Aims and Objectives

- Correlative liaison between immunoglobulin M (IgM) and immunoglobulin G (IgG) antibodies with their immunogenicity related to *T. gondii* in subjects having psychotic anomalies.
- Correlation between positive serological estimations for antibodies in plasma (infected with *T. gondii*) IgM and IgG in patient subjects having psychological anomalies belonging to first level/degree of relatives (FDR) and healthy controls/volunteers (HV).
- Association of the categorical levels of psychological anomalies and positive serological estimates.²

Materials and Methods

In this cross-sectional hospital-based study, four patients diagnosed with schizophrenia (two) and acute and transient psychotic disorder (ATPD) (two) along with three each of “FDR and healthy controls/volunteers,” a total of 10 subjects were examined in the Department of Psychiatry, Gauhati Medical College and Hospital (GMCH), Guwahati, Assam, India.

Subsequently procuring informed patient consent, approximately 5 mL of blood was taken under aseptic conditions by way of venipuncture. Patient blood samples were maintained in similar conditions, centrifuged for 5 minutes at 3000 rotations per minute, and the sera were refrigerated at -20°C until serological examination.²

The extracted serum samples of patient subjects and were further screened for anti-*Toxoplasma* IgG and IgM antibodies in the Department of Microbiology, GMCH using the enzyme-linked fluorescent assay (ELFA) in the mini VIDAS system (bioMérieux) strictly following the manufacturer’s instructions.²

The study was approved by the Institutional Ethics Committee of GMCH.²

Descriptive statistics was used to analyze the data.

Results

Both the sexes are equally distributed (Table 1). All came from rural background. Schizophrenia and ATPD were the diagnoses. Three each were FDR and HV. All had negative IgM status while one had positive IgG status to *T. gondii*.

Tables 2 and 3 demonstrate positive serological markers of anti-*T. gondii* antibodies in various participants and groups, respectively.

Discussion

In the present study of the 10 participants, “*T. gondii*/IgG antibodies noted in one out of four patient subjects” in comparison to none among the six controls [FDR (three) and HV (three)]. Two individuals from the control group (one each of FDR and HV) have shown equivocal IgG status. None of the patients tested positive for IgM. The patient with IgG-positive status had the diagnosis of ATPD.

“Looking at antagonistic results on the aspects of *T. gondii* infection in schizophrenia,” Alvarado-Esquivel et al.³ determined their association in Mexico. “*T. gondii* IgM and IgG antibodies were investigated by employing enzyme-linked immunoassays in respective 50 patient subject samples for schizophrenia and 150 controls. Schizophrenia-linked patient subjects with displayed elevated levels of serological titers of *T. gondii* IgG antibodies when compared to control/HV subjects respectively.”

Cysts formed in chronic *T. gondii* infection have their location in multiple anatomical sites including the brain. Two aromatic amino acid hydroxylases found in the *T. gondii* genome can affect the synthesis of dopamine and serotonin.⁴

In a systematic review, Daryani et al.⁵ show that in the Iranian population, *Toxoplasma* has around 40% seroprevalence rate. Men and women exhibit no differences. Prevalence increases with age. High seroprevalence was observed “in groups who have explicit point of contact with cat/felines, eating raw/uncooked meat and raw fruits or vegetables, in demographic social groups of farmers, housewife, individuals having lesser awareness/education, and mainly thriving in rural households.”

Conclusion

The seroprevalence of IgG anti-*T. gondii* antibodies in psychotic group in relation to controls indicates the potential for further work in this field. A major breakthrough can be achieved by establishing the role of *Toxoplasma* in psychotic disorders that can pave way for not only a brain-based diagnostic system but also novel therapeutic approaches having disease modifying effect.

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Table 1:

Characteristics of the sample

Characteristics	N	%
Sex		
Women	5	50.0
Men	5	50.0
Locality		
Rural	10	100.0
Urban	0	0.0
Diagnosis		
Schizophrenia	2	20.0
ATPD	2	20.0
None	6	60.0
Participant distribution		
Patient	4	40.0
FDR	3	30.0
HV	3	30.0
IgM status		
Negative	10	100
IgG status		
Negative	7	70.0
Positive	1	10.0
Equivocal	2	20.0

Table 2:Seroprevalence of anti-*T. gondii* IgG antibodies in different participants

Participants	IgG status					
	IgG-negative		IgG-positive		IgG-equivocal	
	N	%	N	%	N	%
Patient	3	30.0	1	10.0	0	0.0
FDR	2	20.0	0	0.0	1	10.0
HV	2	20.0	0	0.0	1	10.0
Total	7	70.0	1	10.0	2	20.0

HV, healthy volunteer; FDR, first-degree relative

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Table 3:Seroprevalence of anti- *T. gondii* IgG antibodies in different groups

Groups	IgG-positive		IgG-negative		IgG-equivocal		Total	
	N	%	N	%	N	%	N	%
Schizophrenia	2	100.0	0	0.0	0	0.0	2	100.0
ATPD	1	50.0	1	50.0	0	0.0	2	100.0
None *	4	66.7	0	0.0	2	33.3	6	100.0
Total	7	70.0	1	10.0	2	20.0	10	100.0

* The "none" group constitutes of FDR and HV; ATPD, acute and transient psychotic disorder

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