

## Changes in Personality and Mood profile of Women with Toxoplasmosis

Mushtaq T. Hashim<sup>\*</sup>, Eman Al-Kaseer<sup>\*\*</sup>, Jawad K. Al-Diwan<sup>\*\*\*</sup>,  
Nibras S. Abdul Aziz<sup>\*\*\*\*</sup>, Mohamed A. Hassan<sup>\*\*\*\*\*</sup>

### ABSTRACT:

#### BACKGROUND:

Acquired *T. gondii* infection of immunocompetent patients may cause central nervous system manifestations (Gullain-Bare syndrome or brain abscess) and may be associated with psychiatric manifestation. Iraq is highly endemic with *T. gondii*, however, publications on psychiatric manifestation of *T. gondii* infection are scarce.

#### OBJECTIVE:

To demonstrate psychiatric manifestations in women with Toxoplasmosis.

#### METHODS:

A total of 68 toxoplasma positive pregnant women and 68 toxoplasma negative pregnant women were included in this study. It was conducted for the period of 5<sup>th</sup> Aug. 2008 to 28<sup>th</sup> Feb. 2009. ELISA was used to diagnose *T. gondii*. Questionnaire was used to diagnose personality type and depression was used. The diagnosis was according to ICD<sub>10</sub> and DSM-IV.

#### RESULTS:

Rates of pseudopsychopathic and limbic personality epilepsy syndrome were significantly high among toxoplasmosis positive pregnant women. Significant high rate of depression was associated with acquired *T. gondii* infection.

#### CONCLUSION:

These findings might provide evidence supporting role of *T. gondii* infection in the onset of some behavioral disorders.

**KEYWORDS:** *T. gondii*, personality profile changes, depression, Iraq

### INTRODUCTION:

*Toxoplasma gondii* (*T. gondii*) is a coccidian parasite found worldwide<sup>(1)</sup> that infects nearly one third of humanity<sup>(2)</sup>. Humans acquire a *T. gondii* by ingesting food or water that is contaminated with oocysts shed by cats or by eating undercooked or raw meat containing tissue cysts<sup>(2,3)</sup>.

Acquired *T. gondii* infection in humans are usually asymptomatic, but in some infected persons cervical

lymphadenopathy or ocular disease may occur<sup>(1,3)</sup>. Acquired infection in immunocompetent patients may also cause central nervous system manifestations as Gullian-Bare syndrome<sup>(4)</sup> or cause brain abscess<sup>5</sup>. In addition, acquired acute toxoplasmosis may be associated with psychiatric manifestation<sup>(6,7)</sup>.

In Iraq, high prevalence rate of *T. gondii* was reported<sup>(8)</sup>, however, no article on the psychiatric manifestation of Toxoplasmosis was published. Therefore, this work was carried out to report on personality profile changes and depression among pregnant women with toxoplasmosis in Baghdad, Iraq.

\*Division of Psychiatry, Dept. of Medicine, College of Medicine, Baghdad University

\*\*Dept. of Community Medicine, College of Medicine, Baghdad University

\*\*\*Unit Mental Health, Dept. of Community Medicine, College of Medicine, Baghdad University

\*\*\*\*Dept. of Psychiatric Nursing, College of Nursing, Baghdad University

\*\*\*\*\* Dept. of Microbiology, College of Medicine, Baghdad University

### MATERIALS AND METHODS:

A total of 68 pregnant with toxoplasmosis (cases) and 68 apparently healthy pregnant women with no toxoplasmosis were included in this study which was carried out for the period 5<sup>th</sup> Aug. 2008 to 28<sup>th</sup> Feb. 2009. Cases (toxoplasma infected) and controls (toxoplasma uninfected) were aged matched (14 – 42 years).

Infection by *T. gondii* was diagnosed by enzyme linked immunoabsorbent assay (ELISA) to detect IgG and IgM antibodies. Personality profile was examined by a semi- structured interview for assessment of personality and behavior changes with information (s) can drive ICD<sub>10</sub> and DSM-IV diagnosis<sup>(9)</sup>. Pathological form was classified to apathetic, pseudopsychopathic and limbic epilepsy syndrome. Patient Health Questionnaire (PHQ-9) was used to rate severity of depression. The depression was classified as mild, moderate, and severe depression.

Chi square was used to examine the association of personality profile changes or depression (dependent variables) with toxoplasmosis (independent variable). P value of 0.05 was considered as significant.

### RESULTS:

Pseudopsychopathic personality type was reported in 32 (47.1%) and 26 (38.2%) among toxoplasma positive women and toxoplasma negative women, respectively. The limbic personality epilepsy syndrome was higher among toxoplasma positive women (21, 30.8%) in comparison with that in toxoplasma negative women (7, 10.3%). Pseudopathic and limbic personality epilepsy syndrome were significantly higher among toxoplasma positive women than in toxoplasma negative women ( $p < 0.001$ ). These findings are shown in Table 1.

Table 2 shows that toxoplasma positive women rates mild depression (5.9%), moderate depression (23.5%) and severe depression (70.6%). Toxoplasma negative women had mild depression (39.7%), moderate depression (26.5%) and severe depression (30.9%). There was significant difference in rates of depression of different types between women with toxoplasma positive and negative ( $p < 0.001$ ).

### DISCUSSION:

This study showed significant high rates of pseudopathic and limbic epilepsy syndrome were demonstrated among toxoplasma- infected women (suspicious, jealous, dogmatic, reserved, slow,

controlled and low verbal intelligence) and showed also, high rates of severe depression was noticed among toxoplasma- infected women. These findings are in the line of that of other workers<sup>(10,14)</sup>. They suggested a potential role of *T. gondii* infection in the onset of some behavioral / mental disorders that include schizophrenia, mood disorder, personality profile change and cognitive impairment. Humans with latent toxoplasmosis have significantly deteriorated psychomotor performance (prolonged simple reaction times) in comparison with toxoplasma negative subjects<sup>(15)</sup> and are at higher risk of traffic accidents<sup>(16)</sup>.

The studies on the psychiatric morbidity of *T. gondii* infection were consistent with the effect of *T. gondii* on rodent behavior summarized by Webster<sup>(17)</sup>. He described how *T. gondii* causes a rat to lose its innate avoidance of cats, thus increase the chances that the rat will be eaten by a cat there by enabling the *T. gondii* to complete its life cycle. Noteworthy was Webster's experiment showing that haloperidol apparently suppressed and reversed the effect on rat. It is known that *T. gondii* increases dopamine in rodents<sup>18</sup> and also treating the rodents with selective dopamine uptake inhibitor differently alter the behavior of infected and uninfected rodents<sup>(19)</sup>. The dopamine imbalance between mesolimbic and mesocortical regions in the brain is suspected to play a role in the development of schizophrenia<sup>(20)</sup> which could explain the observed association between schizophrenia and toxoplasmosis<sup>(21)</sup>. Flegr et al<sup>(10)</sup> used changes in the personality dimension novelty seeking for monitoring possible shifts in dopaminergic activity in the brain of infected subjects. Increase a dopamine levels in the infected subjects was expected based on direct measurement of neurotransmitter level in animals<sup>(16)</sup>, and it was reported a positive correlation between schizophrenia and toxoplasmosis<sup>(7)</sup> or risk factors<sup>(22)</sup>.

High levels of steroid hormones have been associated with lower cellular immunity<sup>(20)</sup>. Thus, might be the most parsimonious explanation of the observed of high testosterone- toxoplasmosis association or the higher risk of toxoplasma infection in subjects with higher levels of testosterone and therefore a weaker immunity<sup>(23)</sup>. Alternatively, the behavioral changes induced by *T. gondii* could be side effect of the organism's increase in the testosterone.

## PERSONALITY AND MOOD PROFILE

Theoretically, the infection with *T. gondii* could induce personality changes, personality factors may have influenced the risk of infection and possibly a third factor, such as socioeconomic status may have played a role in both in personality dimensions and also in the risk of infection.

**Table 1: Distribution of personality types among studied groups**

Personality	Toxoplasma positive		Toxoplasma negative	
	No.	%	No.	%
Pseudoretarded	15	22.1	35	51.5
Pseudopsychopathic	32	47.1	26	38.2
Limbic epilepsy personality syndrome	21	30.8	7	10.3
Total	68	100.0	68	100.0

**Table 2: Distribution of depression in the studied groups**

Personality	Toxoplasma positive		Toxoplasma negative	
	No.	%	No.	%
Mild depression	4	5.9	29	42.6
Moderate depression	16	29.4	18	26.5
Sever depression	48	70.9	21	30.8
Total	68	100.0	68	100.0

### CONCLUSION:

These findings might provide evidence supporting role of *T. gondii* infection in the onset of some behavioral disorders.

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