

Toxoplasmosis Among Patients with Immunocompromising Conditions: A Snapshot

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Dear Editor,

Toxoplasma gondii is a worldwide distributed parasite that approximately causes infection in 30% - 40% of the world's human population. The cat is the final host of *T. gondii* and various warm-blooded animals and human are the intermediate hosts. Human get infected through the following ways: i) consuming undercooked meat containing *T. gondii* tissue cysts; ii) consuming food or drink contaminated with oocysts shed through cat feces; iii) congenital transmission and iv) organ transplantation or blood transfusion from infected donors to uninfected recipients (1). Several factors, including host's immunological status affect the course of *T. gondii* infection (1). Acquired *T. gondii* infection in immunocompetent individuals is usually asymptomatic (latent) or associated with minor clinical symptoms such as lymphadenopathy, fever and other nonspecific clinical signs (2).

Why toxoplasmosis is important in patients with immunocompromising conditions?

Unlike the course of toxoplasmosis in immunocompetent individuals, the infection is life threatening in patients with immunocompromising conditions (e.g. HIV/AIDS, cancer and organ transplant recipients). It is very well documented that protective immune response against toxoplasmosis is characterized by a potent T-helper 1 immunity and the inflammatory cytokines, such as interferon gamma (IFN- γ), tumor necrosis factor alpha (TNF- α), interleukin (IL)-12, IL-1 and nitric oxide (NO) secretion (3). On the other hand, impairment of the immune response in patients with immunocompromising conditions increases the incidence and intensity of toxoplasmosis in them. Importantly, reactivation of latent toxoplasmosis in such patients can cause severe infection with fatal outcomes (1, 4). Involvement of the central nervous system (CNC) is the most important appearance of the infection.

However, multi-organ involvement with different symptoms can occur in patients with immunocompromising conditions (1).

Toxoplasmosis in Patients With HIV/AIDS

Toxoplasmosis is one of the life threatening infections in patients with HIV/AIDS (5). In such patients, the incidence and intensity of toxoplasmosis are closely related to CD4+ T-cell counts, particularly when the CD4+ counts fall below 100 cells/mL. Under such circumstances, reactivation of latent toxoplasmosis is the most common cause of severe infection in patients with AIDS (6). A wide variety of clinical symptoms including fever, lymphadenopathy, cutaneous lesions, chorioretinitis and encephalitis are reported in AIDS patients with toxoplasmosis infection. However, toxoplasmic encephalitis (TE) is one of the major causes of death in patients with AIDS. TE usually occurs due to reactivation of latent infection. The greatest risk of TE is in patients with CD4+ counts below 50 cells/ μ L. However, the incidence of TE dramatically decreased after the introduction of highly active antiretroviral therapy (HAART) (7, 8). HAART therapy leads to increased CD4+ count and suppressed HIV viral load (9, 10). Moreover, administration of trimethoprim/sulfamethoxazole (TMP-SMX) and primary prophylaxis significantly decreased the rate of TE in patients with AIDS (11).

Toxoplasmosis in Patients With Cancer

Different studies revealed that toxoplasmosis is more prevalent in patients with cancer compared to healthy individuals. The result of a recent evidence-based meta-analysis showed an association between latent toxoplasmosis with increased risk of leukemia [odds ratio (OR) = 3.05; 95% confidence interval (CI) = 1.83 - 5.08] (12). Another meta-analysis in Chinese patients with cancer revealed that the overall *T. gondii* seroprevalence was higher in patients with cancer compared to healthy individuals

(20.59% vs. 6.31%, $P < 0.001$; OR = 3.90; 95% CI = 3.00 - 5.07) (13). Thomas et al. (14) evaluated the correlation between the incidence of brain cancer and prevalence of *T. gondii* infection in 37 countries. They found that the risk of brain cancer increased 1.8-fold in patients with *T. gondii* infection. Another study in France by the same group of the researchers revealed that the mortality rate of brain cancer increased in patients who were seropositive for *T. gondii* (15).

Toxoplasmosis in transplant recipients

Toxoplasmosis can be transmitted to the transplant recipients from a *Toxoplasma*-seropositive donor to a *Toxoplasma*-seronegative recipient or by the reactivation of latent infection in seropositive recipient (16). Moreover, the risk of infection may increase when both the recipient and donor are seropositive (16). The incidence of toxoplasmosis is highest in cardiac-transplant recipients (16). However, toxoplasmosis is reported from kidney, liver, pancreas, cord blood and bone marrow transplant recipients (17, 18). Toxoplasmosis most likely occurs in the first three months after transplantation; however, it is sometimes reported as early as two weeks post-transplantation (16). Toxoplasmosis is 100% fatal if transplant recipients are untreated (17). Trimethoprim/sulfamethoxazole (TMP-SMX) regimens used for prophylaxis of opportunistic infections (such as *Pneumocystis carinii* pneumonia) are recommended for transplant recipients decreased the risk of *T. gondii* infection in these patients (17). Pyrimethamine-sulfadiazine-folinic acid is the drug of choice for toxoplasmosis in transplant recipients (17).

In conclusion, patients with immunocompromising conditions are at high risk for toxoplasmosis. Hence, programs to screen, treat and prevent toxoplasmosis can prevent life threatening outcomes in such patients and should be considered more seriously.

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