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SHORT COMMUNICATION

High seroprevalence of specific *Toxoplasma gondii* IgG antibodies among HIV/AIDS patients with immunological failure attending a tertiary hospital in northwestern Tanzania

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Abstract

Toxoplasmosis is a major cause of morbidity and mortality among patients with advanced HIV disease. However, there is limited data on the magnitude of toxoplasmosis among HIV patients with immunological treatment failure. Therefore, this study was designed to determine the seroprevalence of specific *Toxoplasma gondii* IgG antibodies among HIV/AIDS patients attending Bugando Medical Centre in Mwanza, Tanzania. Immunological treatment failure was defined using the World Health Organization (WHO) criteria and specific *T.gondii* IgG antibodies were determined using indirect enzyme linked immunosorbent (ELISA). A total of 178 non-repetitive sera from HIV/AIDS patients were analyzed. The mean age of study participants was 38.5±11.3 years. Majority of study participants were males 120 (67.42%). Out of 178 patients, 38 (21.34%) were diagnosed to have immunological failure. *T.gondii* specific IgG antibodies were found in 26 (68.4%) of the patients with immunological failure compared to 46 (32.86%) of those without immunological failure (OR: 4.42, CI: 2.05-9.55; p<0.001). The seroprevalence of *T.gondii* infection is high among patients with immunological treatment failure and place them at a high risk of *T. gondii* encephalitis necessitating sustained trimethoprim-sulfamethaxazole prophylaxis to prevent reactivation.

Keywords: treatment failure, *Toxoplasma gondii*, HIV, Tanzania

Toxoplasmosis is one of the most common opportunistic infections of the central nervous system in immunocompromised patients including acquired immunodeficiency syndrome (AIDS) patients (Luft & Remington, 1992). It is caused by the ubiquitous coccidian intracellular protozoan parasite, *Toxoplasma gondii*. The disease is of public health concern because of the nature of infection, diagnostic and therapeutic challenges to clinicians treating HIV infected patients (Nissapatorn, 2009). In majority of population upon infection, *T. gondii* survives in body tissues in a latent state which has a potential of progressing to life threatening toxoplasmic encephalitis (TE) in immunocompromised patients (Baratloo *et al.*, 2015). Without effective prophylaxis, cerebral toxoplasmosis occurs in about one-third of AIDS patients with <100 CD4 cells/µL (Luft & Remington, 1992). Geographical variation on prevalence of toxoplasmosis among HIV patients has been reported in a range of 3 to 97% worldwide (Falusi *et al.*, 2002; Lindström *et al.*, 2006; Nissapatorn, 2009; Shimelis *et al*., 2009). Few studies on toxoplasmosis have been carried out in Tanzania (Doehring *et al.*, 1995; Swai & Schoonman, 2009; Mwambe *et al*., 2013) but none of them focused on HIV patients. This study was therefore, done to determine the seroprevalence of specific IgG *Toxoplasma gondii* antibodies among HIV/AIDS patients attending Bugando Medical Centre in Mwanza, Tanzania.

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A total of 178 sera from HIV patients collected between May and August 2013 were analysed for specific *T. gondii* antibodies using indirect enzyme immunosorbent assay (ELISA) (ReQuest® Immunoassay kits, Awareness technology Inc. USA) according to manufacturer's instructions. Study included patients aged >11 years on antiretroviral therapy (ART) for at least 12 months. The study excluded all patients with incomplete information regarding CD4 counts. Socio-demographic data was collected by using standardized data collection tool. Immunological treatment failure was defined using the World Health Organization (WHO) criteria (van Oosterhout *et al.,* 2009). Data were entered in Microsoft excel sheet for consistent check and cleaning and analysis was done using STATA version 11. Categorical variables were summarized as proportion while continuous variables were summarized as means. Univariate logistic regression analysis was done to ascertain the association between immunological treatment failure, residence and IgG seropositivity. Odds ratio and 95% CI were noted and p-value of less than 0.05 was considered statistically significant. The protocol for conducting this study was approved by Catholic University of Health and Allied Sciences/Bugando Medical Centre Scientific and Ethics Review Committee.

The mean age of enrolled patients was 38.5±11.3 years. Majority of study participants were males 120 (67.42%). Of the 178 study participants, 16 (8.99%), 151 (84.83%) and 11 (6.18%) had no formal education, basic and tertiary education, respectively. Eighty two (46.07%) and 96 (53.93%) of study participants were residing in urban and rural areas, respectively. Seroprevalence of *T. gondii* specific IgG antibodies was 72 (40.5%, 95%CI: 32.2-47.7%). Of 120 males, 46(38.3%) were IgG seropositive compared 26 (44.8%) of 58 females ($p > 0.05$). A total of 38 (21.3%) patients were diagnosed to have immunological treatment failure. *T. gondii* IgG specific antibodies were found in 26 (68.4%) of the patients with immunological failure compared to 46 (32.86%) of those without immunological failure (OR: 4.42, CI: 1.9-10.4; $p<0.001$) (Table 1).

Table 1: *Toxoplasma gondii* IgG seropositivity and immunological failure

Immunological status	No. (%) of patients IgG positive	No. (%) of patients IgG negative	Total
No Immunological failure	46(32.8%)	94(67.2%)	140
Immunological failure	26 (68.4%)	12 (31.6%)	38
Total	72 (40.4%)	106 (59.6%)	178

Chi^2=15.69, p=0.0001, OR =4.42 95%CI (1.9-10.4)

Out of 82 patients from urban, 38 (46.34%) were IgG seropositive compared to 34 (35.4%) of 96 patients from rural areas (OR 1.57, 95%CI: 0.8-3.0, p=0.138).

This study reports high level of specific *T. gondii* specific IgG antibodies among HIV/AIDS patients. These findings are similar to previous studies (Falusi *et al.*, 2002; Lindström *et al.*, 2006; Walle *et al*., 2013) whereby the prevalence of IgG was found to range between 30 and 87.4%. The seroprevalence observed in the present study is higher than reported by Negash *et al*. (2006) in Ethiopia. The variations are likely to due to different geographical locations and climatic conditions. It has been established that moist and warm temperatures enhance the sporulation of *T. gondii* oocyst (Ferguson, 2009). On average Mwanza has got warm climate that peaks around May to August which may explain high transmission rates.

Though not statistically significant, in the present study it was observed that the prevalence rates of specific *T. gondii* antibodies were higher among participants residing in urban than those from rural areas of Mwanza city. Our findings confirm what was reported by Mwambe *et al*. (2013), whereby high seroprevalence rate of IgG *T. gondii* antibodies was observed among pregnant women from urban than rural areas of Mwanza city. As suggested earlier, high socioeconomic status in urban

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population may explain such high rates as majority can afford to buy pork and poultry meat which have been implicated as major sources of *T. gondii* infection (Sroka *et al.,* 2006).

In this study the odds of being *T. gondii* specific IgG seropositive were significantly higher in patients with immunological treatment failure than those without immunological failure. These findings are comparable with what has been reported previously by Luft *et al*. (1993). Our findings emphasize the need to screen for *T. gondii* IgG antibodies soon after someone is diagnosed with HIV to detect latent infection with *T. gondii*. The double-strength-tablet daily dose of trimethoprim-sulfamethoxazole (TMP-SMX) should be sustained in HIV patients on ART with immunological failure. In conclusion, there is significant high prevalence of toxoplasmosis infection among patients with immunological treatment failure attending Bugando Medical Centre. Prophylaxis for *T.gondii* reactivation needs to be emphasized.

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