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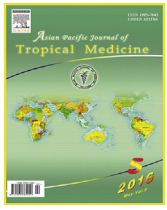

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Anti-*Toxoplasma* antibodies prevalence and associated risk factors among HIV patients

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ABSTRACT

Objectives: To assess the seroprevalence and associated risk factors of toxoplasmosis among HIV patients in Agaro Town Health Center of Jimma zone.

Methods: Convenient sampling was used to collect blood samples from 135 patients attending anti-retroviral therapy from February to March 2015. Serum samples were tested for anti-*Toxoplasma gondii (T. gondii)* antibody by using latex agglutination test. Structured questionnaire was used to collect data on socio-demographic and risk factors associated with toxoplasmosis.

Results: Overall seroprevalence of toxoplasmosis was 80.7% (109/135, *CI*: 74.04–87.36). In multivariate analysis significant association was observed between anti-*T. gondii* seropositivity and raw meat consumption (*OR*: 3.514, *CI*: 1.167–10.581, $P = 0.025$), knowledge about toxoplasmosis (*OR*: 5.225, *CI*: 1.382, $P = 0.015$) and sex (*OR*: 4.023, *CI*: 1.382–19.762, $P = 0.015$).

Conclusions: Immuno compromised patients showed high rate of seropositivity and thus, it is highly advisable to introduce routine anti-*T. gondii* antibodies serological screening test prior to ART commencement.

1. Introduction

Toxoplasma gondii (T. gondii) is an obligate intracellular protozoan parasite that can cause toxoplasmosis in animals and humans [1]. Feline species is the definitive host and plays a central role in the epidemiology of *T. gondii* infections by shedding resistant oocysts to the environment and thus serving as a significant source of infection for food animals and humans [2]. It has been estimated that one-third of the world human population is infected with toxoplasmosis and the incidence rate of 400–4 000 congenital toxoplasmosis cases per year has been reported [3]. The principal route of acquisition of infections are raw or under cooked meat, vegetable or other feed or water, soil contaminated with oocyst and vertical transmission [4]. Among these sources of infection, raw or under cooked meat consumption has been reported to account for more than 30%–60% [5]. Toxoplasmosis has been considered as a major public health problem among immune-compromised and pregnant women. It has been reported that the prevalence is higher in warm and humid environment [6].

Pregnant women with acute infection during pregnancy are at risk of exposing the unborn to congenital infection [7]. Wide geographic variation in the prevalence of latent *Toxoplasma* infection have been reported across the world in Latin America, parts of Eastern/Central Europe, the Middle East, parts of south-east Asia and Africa 30%–75% [8]. Geographical variation of prevalence of toxoplasmosis has been reported in different parts of the world: in United State 15% of childbearing age of women are infected with *T. gondii* [9], 44% in pregnant women in France [10], greater than 60% in Indonesia [8] and less than 8.38% in Eastern China [11].

Literatures indicate that *T. gondii* are asymptomatic in immune-competent persons (Studenicova *et al.*, 2006) but in immune-compromised individuals as $CD4^+$ T cell lymphocyte count decrease, reactivation of the latent *T. gondii* infection follows causing life threatening disease known as toxoplasmic encephalitis [12–14]. Prevalence rate of *Toxoplasma* infection among HIV positive individuals across the world has been found to vary from 3% to 97% [15,16]. According to the report of UNAIDS, 2011 Ethiopia ranks higher in HIV/AIDS prevalence and about 1.5 million people are infected and live with the virus. The seroprevalence of toxoplasmosis among HIV individuals

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documented in different parts of Ethiopia include 88.2% in Arba Minch Hospital [16], 87.4% in Bahir Dar [17] and 60% in South West Ethiopia Mettu Karl hospital [18].

Routine monitoring of *T. gondii* antibodies has been gaining great importance in immune-compromised individuals though it is not a routine practice in different health care centers of Ethiopia. Even the existing majority of seroprevalence studies are limited to HIV/AIDS patients alone with little emphasis to associated risk factors. Furthermore, there has been no document of toxoplasmosis seroprevalence study in Agaro town. Therefore, the objective of this study was to detect the level of prevalence of latent toxoplasmosis in HIV positive patients registered and under follow-up by health professionals. In addition, it was to assess socio-demographic risk factors associated with this infection and forward recommendations that will improve health service delivery.

2. Materials and methods

2.1. Study design and area

The study design was cross-sectional based in public health center and convenient sampling was used based on inclusion criteria of patient's willingness to participate in the study from list of record book of the health center attending anti-retroviral therapy (ART) at Agaro town health center from February to March 2015. Agaro town is located in south western Ethiopia, in Oromia National Regional State, Jimma zone, Agaro Woreda, at a distance of 396 km from Addis Ababa. Its astronomical location is 7° 49′ North Latitude and 36° East Longitude at an elevation ranging from 880 m to 3 360 m above seas level (source Agaro city administration). The area receives mean annual rainfall of about 1 530 mm that comes from the long and short rainy season and the mean annual temperature ranges from 25 °C to 30 °C. Agaro town has a total population of 28 273.

2.2. Study population and sample size

The study populations were human immunodeficiency virus (HIV) positive patients who were on follow up at Agaro town health center for ART. Presently 706 HIV (457 females and 249 males) positive patients attending anti-retroviral therapy. The total sample size was 135; calculated using Thrusfield [19] formula based on prevalence of 88.2% taken from a previous study conducted in Arba Minch Hospital [16], 0.05 margin of error (d) and at confidence level of 95%. Accordingly, one month data of patients visiting the health center for therapy and counseling was used to recruit participants of this study.

2.3. Data collection

About 5 mL of venous blood without anticoagulant was aseptically collected by trained medical laboratory technician following standard procedure from 135 HIV positive patients. Serum was separated and stored at −20 °C until the analyses was conducted at Microbiology laboratory of Jimma University. Trained ART attendant nurse interviewed the participants using structured and pretested questionnaire to collect socio-demographic characteristics and risk factors associated with *T. gondii* infection.

2.4. Serological method

A rapid slide agglutination Toxo-latex test (SPINREACT, S.A/S.A.U Ctra Santa Coloma, Spain) was used strictly following manufacturer instructions for qualitative and semi-quantitative detection of anti-*Toxoplasma* antibodies with analytical sensitivity of 4 IU/mL. Briefly, the test contains latex particles coated with soluble *T. gondii* antigen that are agglutinated when mixed with serum samples containing antibodies against *Toxoplasma* infection. In all sample analysis conducted both positive and negative control tests were performed to monitor the performance of the procedures and technical procedure was carried out correctly. The kit has diagnostic sensitivity and specificity of 96.1% and 89.6%, respectively.

2.5. Data management and analysis

Data was recorded and coded in excel spread sheet before analysis using statistical software SPSS version 22. Descriptive statistics was used to summarize the data and hence, the prevalence of toxoplasmosis was calculated as the number in study population testing positive to serological test divided by the total study unit tested. A logistic regression model was used to check the association of the disease toxoplasmosis with potential risk factors. Non-collinear variables that presented $P < 0.05$ in univariable analysis were offered to the multivariable regression model. The strength of association was calculated using odds ratio at 95% *CI*. $P < 00.05$ was considered as statistically significant.

2.6. Ethical approval

Ethical approval was obtained from our University research ethical review committee and it was in accordance with the ethical standards of our institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

3. Result

3.1. Socio-demographic characteristics of the study participants

Among 706 HIV positive patients attending ART, 135 (84.4%) was included in this study and the percentage of male and female attendees was 43.7% and 56.3%, respectively. Regardless of the disease condition, the mean age of the participants was (33.83 ± 11.11) years (Table 1).

3.1.1. Seroprevalence of T. gondii infection

The overall seroprevalence of *T. gondii* infection in this study was 80.7% (109/135, *CI*: 0.740–0.874). Seroprevalence of *T. gondii* in relation to different socio-demographic factors is presented in Table 1.

3.1.2. Risk factors associated with T. gondii infection

The bivariate logistic regression analysis showed a significant association between seropositivity to anti-*T. gondii* antibodies and presence of cat, raw meat consumption, knowledge about *T. gondii* and sex (Table 1). In multivariate logistic regression analysis, factors such as knowledge about toxoplasmosis, sex