Iranian J Parasitol: Vol. 9, No. 1, Jan -Mar 2014, pp.120-124

Tehran University of Medical Sciences Publication
http:// tums.ac.ir

Iranian J Parasitol

Open access Journal at
http:// ijpa.tums.ac.ir

Iranian Society of Parasitology
http:// isp.tums.ac.ir

Short Communication

Anti-*Toxoplasma gondii* Antibody Levels in Blood Supply of Shiraz Blood Transfusion Institute, Iran

Minoo SHADDEL [1], *Iraj MIRZAII-DIZGAH [2], Mehran HOSHANGI [3]

1. *Dept. of Parasitology, School of Medicine, AJA University of Medical Sciences, Tehran, Iran*
2. *Dept. of Physiology, School of Medicine, AJA University of Medical Sciences, Tehran, Iran*
3. *Blood Transfusion Institute, Shiraz, Iran*

Received 11 Jun 2013
Accepted 10 Dec 2013

Keywords
Blood products,
Toxoplasma gondii,
IgG anti-*T.gondii* antibody,
IgM anti-*T.gondii* antibody

***Correspondence Email:**
emirzaii@razi.tums.ac.ir

Abstract

Background: The prevalence of *Toxoplasma gondii* infection in the blood donors has been poorly studied. The aim of this study was to assess the prevalence of acute and chronic toxoplasmosis in blood products.

***Methods*:** A total of 250 blood products (112 fresh frozen plasma and 138 packed cells) in the Blood Transfusion Institute, Shiraz, Iran were tested for specific *T. gondii* antibodies (IgG and IgM) by ELISA method in 2013. Positive IgG anti-*T. gondii* samples were further tested for IgM anti-*T. gondii* antibody. A positive IgG test with the negative and positive IgM test was interpreted as a chronic and acute toxoplasmosis respectively. The relationship of jobs, blood types, sex, marital status and residency of participants with chronic toxoplasmosis prevalence were statistically analyzed by χ^2.

***Results*:** Of 250 samples, 58 (23.2%) and one were positive for IgG anti-*T. T. gondii* (chronic) and IgM anti-*T. T. gondii* (acute) antibodies levels respectively. Twenty nine (25.9%) of fresh frozen plasma (FFP) samples were positive for IgG anti-*T. gondiii*and 1(0.89%) of them was positive for IgM anti-*T. gondiii* antibody. Thirty (21.74%) of packed cell samples were positive for IgG anti-*T. gondii* antibody. The prevalence of chronic toxoplasmosis was significantly higher in workers, farmers, house wives, unemployed and free jobs (*P*=0.007), people with low education levels (P=0.035) and B type of blood ABO system (*P*=0.0001). However, there were no significant differences regarding to age, sex, marital status, residency and type of blood products.

***Conclusions*:** There were chronic and acute toxoplasmosis in blood products and the prevalence of toxoplasmosis especially chronic form was high. Therefore screening of blood for *T. gondii* antibodies may be considered.

Introduction

Most attention has been paid to the infections of blood supply. Although it is very safe but the transfusion transmitted disease risk is not zero. Toxoplasmosis is a zoonosis caused by *Toxoplasma gondii* which may be transmitted by blood transfusion (1). Toxoplasmosis infection includes acute and chronic phases. "The acute invasion, characterized by parasitemia, is a transient stage followed by chronic invasion when parasites reside within different tissue in cysts" (1-4). Most of this infection is chronic without clinical symptoms in immunocompetent humans, although it may cause severe or fatal infection in immunodeficient patients (2). Since *T. gondii* organism may be alive in the citrated blood at 5 °C for up to 50 days and the buffy coat (5), so it appears likely that toxoplasmosis could be acquired via blood or leukocytes transfusions especially if parasitized leukocytes are transfused in a high concentration (5). Multiple units of blood from different donors are regularly used in children with thalassemia, sickle cell anemia and aplastic anemia who need regular, frequent and multiple transfusions for survival. Many studies showed high prevalence of *T. gondii* antibodies in healthy voluntary blood donors (6-13) whiles screening for *T. gondii* before transfusion blood has nott been considered yet. The information about the epidemiology of *T. gondii* infection in blood donors is low.

The aim of this study was to determine the prevalence of *T. gondii* infection in blood donors of Shiraz City, Iran and identify characteristics of blood donors associated with seropositivity.

Materials and Methods

Study design

We performed a cross sectional study in the blood transfusion institute of Shiraz City, Iran in 2013. Samples was collected from voluntary blood donors and were routinely tested for human immunodeficiency virus (HIV), hepatitis B virus, hepatitis C virus, Anti HTLV1, 2 and *Treponema pallidum* (syphilis).

Laboratory tests

Samples included packed cells (PC) package (n = 138) and fresh frozen plasma (FFP) (n = 112). PC packages were centrifuged (2000 g, 10 min) and the plasma was separated and stored at −70 °C. Plasma samples were analyzed for anti- *T. gondii* IgG and IgM antibodies by ELISA technology using commercially available kits (DSI, Germany). Anti- *T. gondii* IgG antibodies levels of > 14.5 UL/mL were considered to be positive.

Anti- *T. gondii* IgM antibodies levels were assessed in samples that IgG anti-*T. gondii* was positive. Anti- *T. gondii* IgM antibodies levels of > 1.1 UL/mL were considered to be positive. Samples with positive IgG and negative IgM anti-*T. gondii* antibodies were considered as a chronic toxoplasmosis, whiles those with both positive IgG and IgM anti-*T. gondii* antibodies were considered as an acute toxoplasmosis.

Statistical analysis

Statistical analysis of χ^2 and Exact Fisher's tests were performed to compare the prevalence of chronic toxoplasmosis for term of age, sex, educational level, residence place, marital status, occupation, blood types and kind of blood products.

Results were considered statistically significant if $P < 0.05$. Analyses were performed using SPSS software version 16 (SPSS Inc., Chicago, IL, USA).

Results

The prevalence of chronic and acute toxoplasmosis was 23.2% and 0.4% respectively. Among these positive IgG anti-*T. gondii* antibody samples, just one sample of FFP was positive for IgM anti-*T. gondii* antibody (Table 1).

Table 1: Percent of acute and chronic Toxoplasmosis in blood products

Kind of blood products	Chronic Toxoplasmosis	Acute Toxoplasmosis
FFP (n=112)	28 (25)	1 (0.89)
PC (n=138)	30 (21.74)	0 (0)
Total (n=250)	58 (23.2)	1 (0.4)

FFP: fresh frozen plasma; PC: packed cells

In term of occupation, the prevalence of chronic toxoplasmosis was significantly high in workers, farmers, house wives, unemployed and free jobs (68.4%) than in mental activity job and employees (25.9%) (*P*=0.007). Along with the ABO blood type system the rate of chronic toxoplasmosis were 16%, 17%, 30% and 47% in O, A, AB and B types respectively. It was significantly higher in AB and B than the O and A types (*P*=0.000).

There was no significant difference in prevalence of chronic toxoplasmosis between FFP (27%) and PC (24%) samples (*P*=0.0603). There were also no significant difference in prevalence of chronic toxoplasmosis regarding age, sex, marital and residency.

Discussion

In the present study, we have shown that of 250 samples 59 (23.2%) and one had chronic and acute toxoplasmosis respectively. In comparison to previous studies conducted in Iran, it was similar to the result of Sharif et al study (22%) (14). However the result is not similar to other studies in different parts of Iran. It is lower than Salahi- Moghaddam (68.4%), Assmar (51.8%) and Gorbani (55.7%) reports (15-17) and higher than Gorbani 17.7% study (18). The result is also similar to other studies in other countries (6-9, 19).

Acute toxoplasmosis was observed only in the FFP. Additionally, prevalence of chronic toxoplasmosis was higher in the FFP as compared to the PC packages and these may depend on the way of FFP sample maintenance which transferred to freezer immediately and causes to preserve the antibody level better.
High rate of prevalence shows that the risk to get infection by recipients might be high. The prevalence of acute toxoplasmosis was 0.4% in this study and it may indicate the possible recent infection and may remain undiagnosed (19) which is evidence for active *T. gondii* in blood. As *T. gondii* might be transmitted by blood supply, it may alarms for patients with different immunodeficient who are at highest risk of exposure to transfusion transmitted diseases. As Nimir and coworker in Malaysia mentioned there is an association between seropositivity in positive history of blood transfusion in patients with different malignancy and in this group seroprevalence was higher than who had negative history and this study suggests a larger sampling recommended to be able to determine these association before any conclusion (19) and in different studies suggested more attention before blood transfusion and mentioned the possible reactivation of this opportunistic parasite (6, 20-22).

There was no significant difference in prevalence rate of anti- *T. gondii* antibodies regarding to age group, marital status, sex, residency and kind of blood product which is similar to the results of different studies (14,15).

According to occupation, individuals included mental activity job and employee had the significant lower rate of positivity than other individuals included workers, farmers, housewives, unemployed and free jobs. It seems that the first group is less contact with risk factors which is similar to the results of previous studies (15, 23).

According to educational level, people with academic education had significantly lower rate of positivity than who has low education level. This might be due to the more awareness of the first group. It is similar to the result of the Hashemi and Saraei study (23).

As regards to blood types, interestingly, individuals with AB and B types had significantly high rate of positivity than the other types. It suggests do to more survey about the status of sensitivity in different blood types against *T. gondii* To the best of our knowledge, this is the first.

Conclusion

Screening of blood for anti-*T. gondii* antibodies must be undertaken and use of FFP sample for detection is recommended.

Acknowledgements

We would like to acknowledge the laboratory staff in the Imam Reza Hospital. We also thank the hospital managements for giving us permission to commence this study. The Ethics Committee of AJA University of Medical Sciences, Tehran, Iran, approved the study protocol. The purpose and procedures of the study were explained to all participants, and a written informed consent was obtained from all of them. The authors declare that there is no conflict of interests.

References

1. Wu YY, Snyder EL. Safety of the blood supply: role of pathogen reduction. Blood Rev. 2003; 17(2):111-22.
2. Dalimi A, Abdoli A. Latent toxoplasmosis and human. Iran J Parasitol. 2012;7(1):1-17.
3. McCullough J. Progress toward a pathogen-free blood supply. Clin Infect Dis. 2003;37(1):88-95.
4. Alipour A, Shojaee S, Mohebali M, Tehranidoost M, Abdi Masoleh F, Keshavarz H. *Toxoplasma* infection in schizophrenia patients: a comparative study with control group. Iran J Parasitol. 2011; 6(2):31-7.
5. Siegel SE, Lunde MN, Gelderman AH, Halterman RH, Brown JA, Levine AS, et al. Transmission of toxoplasmosis by leukocyte transfusion. Blood. 1971;37(4):388-94.
6. Sundar P, Mahadevan A, Jayshree RS, Subbakrishna DK, Shankar SK. *Toxoplasma* seroprevalence in healthy voluntary blood donors from urban Karnataka. Indian J Med Res. 2007; 126(1):50-5.
7. Nissapatorn V, Noor Azmi MA, Cho SM, Fong MY, Init I, Rohela M, et al. Toxoplasmosis: prevalence and risk factors. J Obstet Gynaecol. 2003;23(6):618-24.
8. Alvarado-Esquivel C, Mercado-Suarez MF, RodrÃ¬guez-Briones A, Fallad-Torres L, Ayala-Ayala JO, Nevarez-Piedra LJ, et al. Seroepidemiology of infection with *Toxoplasma gondii* in healthy blood donors of Durango, Mexico. BMC Infect Dis. 2007; 7:75.
9. Chiang TY, Hsieh HH, Kuo MC, Chiu KT, Lin WC, Fan CK, et al. Seroepidemiology of *Toxoplasma gondii* Infection among Healthy Blood Donors in Taiwan. PLoS One. 2012;7(10):e48139.
10. Elhence P, Agarwal P, Prasad KN, Chaudhary RK. Seroprevalence of *Toxoplasma gondii* antibodies in North Indian blood donors: implications for transfusion transmissible toxoplasmosis. Transfus Apher Sci. 2010;43(1):37-40.
11. Liu Y, Zheng K, Chen M, Fu L, Du W, Shi Z. Study on detecting antibodies to *Toxoplasma gondii* in pooled serum of blood donors by Dot-IGSS. Southeast Asian J Trop Med Public Health. 2001;32(3):558-61.
12. Yazar S, Eser B, Yay M. Prevalence of anti-*Toxoplasma gondii* antibodies in Turkish blood donors. Ethiop Med J. 2006;44(3):257-61.
13. Yilmaz GR, Babür C, Kiliç S, Taylan Ozkan A, Beyaz E, Karakoç AE. Short communication: investigation of *Toxoplasma gondii* antibodies in blood donors by Sabin-Feldman Dye Test. Mikrobiyol Bul. 2006;40(4):375-81.
14. Sharif M, Daryani A, Barzegar G, Nasrolahei M. A seroepidemiological survey for toxoplasmosis among schoolchildren of Sari, Northern Iran. Tropical Biomedicine. 2010; 27(2): 220–225 .
15. Salahi-Moghaddam A, Hafizi A. A serological study on *Toxoplasma gondii* infection among people in south of Tehran, Iran. Korean J Parasitol. 2009;47(1):61-3.
16. Assmar M, Amirkhani A, Piazak N, Hovanesian A, Kooloobandi A, Etessami R. Toxoplasmosis in Iran. Results of a seroepidemi-

ological study. Bull Soc Pathol Exot. 1997; 90(1): 19-21.
17. Ghorbani M, Edrissian GH, Assad N. Serological survey of toxoplasmosis in the northern part of Iran, using indirect fluorescent antibody technique. Trans R Soc Trop Med Hyg. 1978;72(4):369-71.
18. Ghorbani M, Edrissian GH, Afshar A. Serological survey of human toxoplasmosis in mountainous region of the north-west and southwest parts of Iran (1976-77). Trans R Soc Trop Med Hyg. 1981; 75: 38-40.
19. Nimir A, Othman A, Ee S, Musa Z, Majid IA, Kamarudin Z, et al. Latent toxoplasmosis in patients with different malignancy: a hospital based study. J Clin Med Res. 2010;2(3):117-20.
20. Longoni DV, Fumagalli R, Fumagalli M, Cappellini A, Uderzo C. Severe disseminated toxoplasmosis after unrelated bone marrow transplantation: a case report. Haematologica. 2000;85(7):781-2.
21. Nissapatorn V, Kamarulzaman A, Init I, Tan LH, Rohela M, Norliza A, et al. Seroepidemiology of toxoplasmosis among HIV-infected patients and healthy blood donors. Med J Malaysia. 2002;57(3):304-10.
22. Tong DS, Yang J, Xu GX, Shen GQ. Serological investigation on *Toxoplasma gondii* infection in dialysis patients with renal insufficiency. Zhongguo Xue Xi Chong Bing Fang Zhi Za Zhi. 2011;23(2):144-53.
23. Hashemi HJ, Saraei M. Seroprevalence of *Toxoplasma gondii* in unmarried women in Qazvin, Islamic Republic of Iran. East Mediterr Health J. 2010;16(1):24-8.