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Research Article

Seroprevalence of Toxoplasmosis among blood donors in a Tertiary Care Teaching Hospital in South India

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ABSTRACT: Blood transfusion is a life saving contrive, also associated with various infectious risks. Transfusion transmissible infectious agents are among the greatest threats to blood safety of the patients who receive blood. Screening of all types of infectious diseases before transfusion is a hectic task now in transfusion medicine. Malaria is the most important protozoan disease transmitted by blood transfusion followed by toxoplasmosis. It is one of the notifiable communicable diseases among rural and urban population. Serological screening of *Toxoplasma gondii* is very important to prevent such infection transmission. We evaluated the seroprevalence of *T. gondii* in healthy population of blood donors in Tiruchirapalli, South India. A total of 207 serum samples collected from healthy voluntary blood donors was tested for *T. gondii* antibodies by IgM ELISA serology. Out of 207 subjects, 46 (22.2%) were seropositive to *T. gondii.* The prevalence of *T. gondii* antibodies showed high in our study in healthy voluntary blood donors. Thus we suggested to include the screening of *T. gondii* as a priority test in all pretransfusion blood testing schedule.

Key Words: Blood donors, Serology, toxoplasmosis

Introduction

Like bacterial and viral diseases, many parasitic diseases are also known to be more risk of transmitting by blood transfusion. Of great concern, toxoplasmosis also contributes to similar risk like other infectious diseases in different geographical regions [1]. *Toxoplasma gondii* infection in blood donors could represent a risk for transmission in the patient show received blood in various medical emergencies. The epidemiology of *T. gondii* infection in blood donors in Tiruchirapalli is scarce [2]. The highest frequency in antibody titres of *T. gondii* might be due to differences in climatic conditions, culinary habits and exposure to the sources of infection [3].

Of great relevance to the society is the danger of transmission of *T. gondii* infection by transfusion of blood from asymptomatic, apparently healthy individuals exposed to the infection [4]. With the availability of facilities for bone marrow, renal and hepatic transplantation, cardiac surgery with extracorporeal circulation and neurosurgical procedures for resection of vascular tumours and aneurysms, multiple units of blood from different donors are used regularly [1,5].

Transfusion transmitted *T. gondii* can result in significant clinical consequences in immunocompromised and multiply transfused patients, pregnant women etc, where the reflection of IgM specific antibodies leads to the risk of transfusion transmission [6]. Every unit of blood transfusion there is a 1% chance of transfusion related complications, including transfusion transmitted infections [7]. An increase in transfusion related infection has been reported in India. India is already carrying a burden of 50 million of HBV carriers and 2,027 million HIV cases. Keeping in mind the grave consequences of these infections and to restrain the transmission to a minimum, it is very important to remain vigilant about the possible spread of these diseases through blood transfusion [8].

T. gondii is usually transmitted to humans, orally (by ingesting food or water, contaminated with oocytes from infected cat feces or tissue cysts in meat). However, blood or leukocyte infusion, organ transplantation and transmitted via the placenta are other possible routes of infection [9]. The infection can result in severe consequences, including encephalitis, chorioretinitis and myocarditis in immunocompromised individuals, like transplant recipients and HIV-positive patients [10]. It has been demonstrated that *Toxoplasma* infection can be transmitted through blood transfusion. Since *T. gondii* organism may stay alive in citrated blood, at 5°C, for up to 50 days and the buffy coat, it is likely that toxoplasmosis could be acquired via blood or leukocyte transfusions, especially if parasitized leukocytes are transfused in a high concentration [1].

Multiple blood units from different donors are regularly administered to children with thalassemia, sickle cell anemia and aplastic anemia who need regular, frequent and multiple transfusions for survival [11,12]. Many studies have shown a high prevalence of *T. gondii* antibodies in healthy volunteer blood donors, while pre-transfusion *T. gondii* screening has not been considered yet [2,12]. No studies have been conducted on the epidemiology of *T. gondii* infection in these region blood donors. Healthy seropositive blood donors,

especially those who are in the acute phase of the infection, may have a major role in this scenario [5,13]. The rate of *Toxoplasma* infection in healthy blood donors varies in different areas of the world and this mainly depends on the rate of infection in the community.

Screening for *Toxoplasma* in blood and blood product is not mandatory in India. This poses a great risk to the recipients of blood and blood products, especially large columns at multiple sittings [14,15]. A pilot study is therefore planned to assess the seroprevalence of *T. gondii* in the blood collected from healthy voluntary donors at the Department of Transfusion Medicine (blood bank), Tertiary care teaching hospital, Tiruchirapalli.

Materials and Methods

Study design

We performed a cross sectional study by screening the presence of antibodies against T. gondii in all blood donors received in a tertiary care teaching hospital and also obtained from medical camps.

Participants

All blood samples from blood donors were routinely screened for HIV, hepatitis B virus surface antigen (HBsAg), hepatitis C virus (HCV) and syphilis. Study participants were voluntary blood donors who met the following criteria

i. Individuals age of 18 and above

ii. Individuals who agreed to participate in the study

iii. Individuals who gave written informed consent

iv. Individuals who tested negative for HIV, HCV, HBsAg and syphilis

Recommended donor exclusion criteria were: history of febrile or debilitating illness, weight loss, jaundice, hepatic or cardiovascular or pulmonary derangement, malignancy, epilepsy, bleeding diathesis, past blood transfusion, recent blood donation, consumption of prohibited drugs, surgical intervention, age under 18 or over 60 years, pregnancy or lactation [16].

Ethics

This work was approved by the Institutional Research Board and certified by an Institutional Ethics committee of Chennai Medical College Hospital and Research Centre (SRM Group), Tiruchirapalli, India. Written informed consent was obtained from all participants before blood sampling.

Serological testing

A total of 207 blood samples from healthy blood donors were collected from June to December 2015. Sample size estimation for inclusion of the samples was based on the proportion of the blood donation done in the study centre.

The volunteer donors were healthy adults, screened routinely by physical examination with no history of infections in the recent past, according to the guidelines of Drugs and Cosmetics Rules, Government of India (Sundar et al., 2007). Sera were separated and stored at -20^{o}C until further testing. All the serum samples were tested for IgG and IgM anti-T. Gondii antibodies separately using commercially available enzyme linked immunosorbent assay (ELISA) kit and the results were interpreted by following the instructions of the manufacturer.

Result analysis

The demographic details including age, sex, habitats, dietary habits (vegetarian/non vegetarian) were recorded and the seroprevalence of IgG and IgM anti-T. gondii data were calculated with respect to donor variables and entered in SPSS and cross tabulated for descriptive and analytic statistics. The discrete variables were expressed as percentages and a *p* value of <0.05 was considered significant.

Results and Discussion

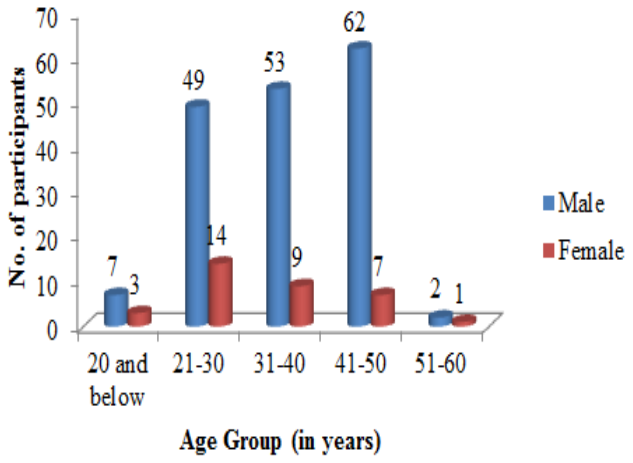
The maximum of 69 cases was recorded in the age group of 41-50 years, followed by 21-30 and 31-40 with 63 and 62 cases respectively. A total of 173 males and 34 females were interpreted in this study. The detailed description related to age of total participants and serologically positive to toxoplasmosis is depicted in the table 1. Further the sexwise descriptions were impregnated in figure 1.

Table 1: Age and sexwise determination of seroprevalence of toxoplasmosis

Age group (in years)	Total participant (n=207)	Positive serology to toxoplasmosis (n=46)
20 and below	10 (4.8)	8 (17.4)
21-30	63 (30.4)	24 (52.2)
31-40	62 (29.9)	10 (21.7)
41-50	69 (33.4)	3 (6.5)
51-60	3 (1.5)	1 (2.2)

[Figure in parenthesis denoted percentages]

Figure 1: Sexwise distribution of subjects included for toxoplasmosis screening



In 207 donors where dietary habits were recorded thereby 93.7% are non vegetarians. Out the donors, 22.2% are seropositive to IgG antibody to *T. gondii*. The titres ranged from 27 to 297 IU/ml. In the age range of 20 and below, 8 donors were seropositive for *T. gondii*. In the remaining age groups, including 21 to 30, 31 to 40, 41 to 50 and 51 to 60; 24, 10, 3 and 1 donors were serologically reactive to toxoplamosis (Table 1).

Among the 46 seropositive donors, 31 (67.4%) individuals are residing in urban and 15 (32.6%) are from rural inhabitants. Among the females, 14 (30.4%) were seropositive. Five were low avidity confirming recent infection while others had high avid antibodies. Among the 46 donors positive for *T. gondii* IgG, 2 were vegetarians and others were non vegetarians. The comparativeness of serologically positive toxoplasmosis with blood groups was also documented in this study. Among the 46 sero-positive samples, 20 are O positive, 15 are B, 9 are A and 2 samples supported AB positive blood groups. None of the samples showed Rh negative in this study. Serological screening of coinfections was not done in this study.

The seroprevalence of toxoplamosis in this study was 22.2%. The seroprevalence of toxoplasmosis varies widely among different regions of the globe [1]. The geographical distribution of toxoplasma IgG seroprevalence in general population in India also varies from state to state, including New Delhi (57%) [17]; Chandigarh (4.66%) [18]; Jodhpur (17.2%) [19]; Mumbai (30.9%) [14] and Bangalore (20.3%) [1]. The variations found among various regions could be related to socio-cultural habits, geographic factors, environmental factors, general hygiene in the society, transmission mode and diagnostic methods employed [12].

It is also observed that seroprevalence rates in females are low, though this may not be a true reflection of the situation in society, as female blood donors are less frequent in the blood donation camps. The prevalence in females in the society examined with 180 pregnant women in the first four months of pregnancy showed 45% for *Toxoplasma* IgG seropositive and among them only 3.3% were positive for IgM with low avidity antibodies indicating recent infection [15].

In this study of including healthy blood donors, the comparativeness of *Toxoplama* seropositivity cannot be done due to absence of previous studies. This could be explained that the prevalence of toxoplasmosis in this study subjects is subject to understand the need of proper guidelines and management in preventing the impending incidence of toxoplasmosis in the future years. It is also suggested to take considering that once healthy persons turn to be immunocompromized, Toxoplamosis is definitely not an easy task to deal with, particularly in the clinical presentations which is mimicking with other diseases of central nervous system.

The age distribution in this present study showed the highest prevalence among the age group of 21-40 which also presented in other studies [12] but declined in the prevalence when the individual's age increased (Table 1). This age group is more vulnerable in the life style to acquire *Toxoplasma* infections rather than other age groups. Further studies required to include a larger sample size for the clarification of appropriate interpretation of the data.

In this study on analysis of the interrelationship between various possible risk factors, No significant observation of contact with animals (*Felis catus* – cat), consumption of undercooked meat, history of blood transfusion. It was interestingly notified that no significant association with *Toxoplasma* infection with cat which was also depicted in other studies [12,20].

Since the data need to be justified, it is proposed to stratify the subjects according to the risk exposure in multi-variate analysis and there was significant higher in healthy blood donors without history of all possible risk factors of *Toxoplasma* infection. Further, this could be resolved that other possible risk factors may have and as yet determined role to infection or because of the limited sample size that caution is needed in the interpretation of these data.

Conclusion

Toxoplasmosis is the most life threatening opportunistic parasitic disease and a major health problem worldwide exclusively in immunocompromised. This study was emphasized on the overall of toxoplasmosis as well as its characteristics which will be seen more frequently in this study area. Consequently, because of the high seropositivity of *T. gondii*, the health authorities should be alerted and preventive measures should be taken.

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