

Antibody Detection of *Toxoplasma gondii* on Blood Donor at PMI Kota Yogyakarta by Rapid Diagnostic Methods in 2022

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Abstract. Toxoplasmosis is a disease that caused by *Toxoplasma gondii* parasite. *Toxoplasma gondii* is a group of protozoa, and it belongs to intracellular obligate parasites. This parasite mostly found in animal, and it can be dangerous, on many cases, it can cause death with no symptoms. The purpose of this study is to find out the percentage of IgG and IgM antibodies examination of *Toxoplasma gondii* on blood donor in PMI Kota Yogyakarta. This study belongs to descriptive observational type, with cross-sectional design to find out the results of antibody detection on *Toxoplasma gondii*. The detection was carried out by Rapid Diagnostic Methods that can detect the presence of IgG and IgM antibodies. This study was also using questionnaires to know the relationship between the daily behaviours with toxoplasmosis case. The results show that 14 samples were reactive on IgG antibody parameter (76%) and 11 samples were non-reactive (24%). From the questionnaires known that the daily behaviour's such as having a cat, eating raw/undercooked meat products, eating unwashed fruits and vegetables related to the case of toxoplasmosis.

1 Introduction

Toxoplasma gondii is a parasite that causes zoonotic diseases, especially toxoplasmosis. This parasite can be found around the world. *Toxoplasma gondii* is a group of protozoa that belongs to obligate intracellular parasite. Toxoplasmosis can be caused by swallowing cysts on undercooked meat, raw fruits and vegetables, accidentally ingesting oocysts from the environment. *Toxoplasma gondii* can also cause infection in human through blood transfusion [1]. The prevalence of toxoplasmosis on human in Indonesia was range from 2-63% while in animal was range about 6-70% depends on climate, geographical factors, and the presence of stray cats in specific area. The infection of *Toxoplasma gondii* usually did not shown any clinical manifestation [2].

The infection of *Toxoplasma gondii* in pregnant women can increase the prevalence of miscarriage. When *Toxoplasma gondii* is infected in babies, it can cause deformities of the head and neck such as hydrocephalus, microcephaly, intracranial calcification. When it

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infected in heart, it causes heart failure, pericardial effusion, and in the abdomen such as hepatosplenomegaly, echogenic bowel, hepatic calcification, meconium peritonitis and ascites. When pregnant women were having toxoplasmosis, it can also transmit the parasite to the fetus through the placenta or can be transmitted during the birth which can cause the baby to suffer from ocular diseases such as chorioretinitis, central nervous system disorders such as hydrocephalus, microcephalus, and cerebral calcification [3].

One of the risk factors that cause toxoplasmosis is receiving a blood donor. If the blood from donor contains *Toxoplasma gondii* then can cause blood transfusion reactions. Blood transfusion reactions and the risk of transmitting *Toxoplasma gondii* through blood is very dangerous for recipients [4,5]. In Indonesia, the government regulates the blood safety through The Regulation of Ministry of Health Number 91 in 2015. The blood that will be distributed is blood that has passed the 4 parameters of transfusion transmitted infections screening, which includes HIV, Hepatitis B, Hepatitis C and Syphilis [6], but there is no parameters of *Toxoplasma gondii* screening. From the situation above, the screening of *Toxoplasma gondii* in blood donor is important to do to increase the safety of blood products and patients' safety. This can also be used to prevent the transmission of *Toxoplasma gondii* through blood transfusions. *Toxoplasma gondii* infection itself considered a dangerous microorganism for patients taking drugs as a result of undergoing an organ transplant such as a kidney and liver, including patients suffering from HIV and cancer [5,7,8].

PMI Kota Yogyakarta, is one of the blood donor units that process and release blood products on a large scale. Meanwhile, UDD PMI Kota Yogyakarta only carried out 4 parameters of transfusion transmitted infection (HIV, Hepatitis B, Hepatitis C, and Syphilis), and another blood-transmitted infection such as toxoplasmosis was not tested. Based on the problems above, the screening of *Toxoplasma gondii* in blood products become very important. The aim of this research was to create standards for safe blood products and to avoid the spread or transmission of *Toxoplasma gondii* through blood transfusions. This research is important to be carried out to support the safety of blood products.

2 Materials and Methods

This research belongs to descriptive observational type with cross-sectional design which carried out in one measurement of variables in the sample of blood donor to find out the results of the *Toxoplasma gondii* antibody detection. The samples taken are blood donor, then to detect the antibody of *Toxoplasma gondii* was using the IgG/IgM rapid diagnostic methods. This research was approved by Ethics Committee of STIKES Guna Bangsa Yogyakarta with Ethics Approval Number 010/KEPK.VII/2022

2.1 Materials

The materials that used on this research is the sample of blood donor, solution buffer, rapid diagnostic test cassette of *Toxoplasma gondii*, and alcohol swab. While the tools are centrifuge, tube rack, and timer.

2.2 Methods

This research was carried on three steps, which preparation step, research step, and data interpretation step.

2.2.1 Preparation step

The research preparation step was done by location survey and having an approach to UDD PMI Kota Yogyakarta that has concern to request an approval to do an implement study. The arranging of research permit letter from the head of UDD PMI Kota Yogyakarta to conduct toxoplasmosis examination research on blood donors at UDD PMI Kota Yogyakarta.

2.2.2 Research step

The research steps refer to Singh [13] and initiated by the collection of blood donors. The blood sample was carried out from donors' vein by syringe. The blood then being centrifuged on 3000 rpm for two minutes to separate between red blood cells and plasma.

The antibody screening was examined by rapid diagnostic test cassette. The plasma was carried out for at about two until three drops and the buffer solution was added to the cassette. The test results will appear on 15 minutes. The negative result is when only one colour line appears on control area. This result shows that there is no anti-TOX IgG/IgM in the specimen. The positive result is if there are three lines (C, T2, T1) or two lines (C, T2) which appears in the cassette area. This shows that the specimen contained detectable amounts of anti-TOX IgG/IgM. While the invalid results if there is no coloured strip appears on control region, that indicates of possible errors in carrying out the test. The test must be repeated using the new device.

2.2.3 Data interpretation step

The data that has been collected will be analysed univariately to know the percentage of *Toxoplasma gondii* IgG/IgM antibody examination results in blood donor. The data will be processed by using Microsoft Excel).

3 Results and Discussions

Table 1. The Results of RDT of *Toxoplasma gondii* Antibodies.

Test Results	Frequency	Percentage (%)
IgG reactive	14	56
Non-reactive	11	44
Total	25	100

This study uses the rapid diagnostic test DALF which has capability to detect the IgG/IgM of *Toxoplasma gondii* antibodies with sensitivity ranges from 68-89% and specificity 91-100%. Based on the results of Rapid Diagnostic Test (RDT) for *Toxoplasma gondii* antibodies shows that 14 blood donor samples were reactive on IgG parameters (56%) while 11 samples were non-reactive (44%) (Table 1.). These results show that in blood samples from reactive respondents had antibodies against *Toxoplasma gondii*, based on the results of interviews have similar behaviour causes reactive IgG antibodies. Neither did the results of the examination IgM reactive results were obtained.

IgM antibodies are the first antibodies to form when someone is infected with *Toxoplasma*. So, the IgM detected indicates that the person has recently had a *Toxoplasma* infection. The possibility that parasites are still circulating in the body is quite large in someone who is reactive IgM *Toxoplasma*. While IgG is antibodies circulating in the blood or body fluids, presence of IgG shows that the antibodies have been infected for a long time, or has recovered but the antibodies are still there. On this research, if the blood donors contain

the IgG of *Toxoplasma*, it will be causing post-transfusion reactions, especially in patients with immunodeficiency.

Table 2. The Distributions of Respondents' Age.

Age Range	Frequency	Percentage (%)
Teenagers (17-30 years)	8	32
Adults (31-50 years)	15	60
Elderly (>50 years)	2	8
Total	25	100

The respondents in this study were donors who passed the criteria for blood donating at PMI Kota Yogyakarta grouped by age range from teenagers, adults and elderly (Table 2.). Based on the results of data frequency distribution analysis in table 2 shows that the age category of donors can be seen from the higher percentage were from adults aged 31-50 years with 15 people (60%), teenage respondents aged 17-30 years were 8 people (32%) and elderly group aged >50 years were 2 people (8%). It can be seen that the most samples that have reactive results were in the adult respondent group. This is also due to the number of respondents who took part in the research were dominated by the adult group and can also be caused by the productive age mostly have a lot of outdoors work in the environments where there is a high risk of contamination (farms, farming, gardening), and consuming raw meat and vegetables that undercooked [9]. The elderly age group have a higher risk of toxoplasmosis infection because their immunity has decreased so it is easy being infected [10].

Table 3. The Distributions of Respondents' Job.

Type of Job	IgG Reactive		Non-Reactive	
	Frequency	Percentage (%)	32	Percentage (%)
Laborers	3	12	1	4
Teachers	1	4	0	0
Students	3	12	3	12
Civil Servants	0	0	4	16
Private Employees	3	12	2	8
Self-Employees	4	16	1	4
Total	14	56	11	44

The RDT result based on working group of donors were the laborers, 3 respondents were IgG reactive, while 1 respondent was non-reactive. the teachers, 1 respondent was IgG reactive, while there is respondent with non-reactive test result. 3 students were IgG reactive and the others 3 were non-reactive. All the civil servant respondents were non-reactive (4 respondents). 3 private employees were IgG reactive, and 2 others non-reactive. 4 self-employed respondents were IgG reactive, and 1 respondent was non-reactive (Table 3). This result is because self-employed do more work outside the home. The person could also be infected by *Toxoplasma* from other behaviours such as having direct contact to the soil that has been contaminated with oocysts. Seroprevalence of positive toxoplasmosis on beef cattle at slaughterhouses in Surabaya is 65%. This could be risk for workers to be infected with toxoplasmosis if they do not apply a good personal hygiene, so the chance of being infected with toxoplasma is greater [11].

Toxoplasmosis examination is important for humans as an intermediate host for *Toxoplasma gondii*. On human, *Toxoplasma gondii* can migrate through the bloodstream by carrying out blood from transfusion activities [12]. The efforts to keep blood safe, it is necessary to check diseases that can be transmitted through blood transfusions. Transmission

prevention through donor blood is important because of its availability, safety and easy access to blood products [6]. The results of this research can be used as a reference and can be used to provide information and references regarding the importance of maintaining behaviours which can cause *Toxoplasma gondii* and how important the examination of *Toxoplasma gondii* in blood donor, so the safety of blood products can be improved and prevents toxoplasma transmission through transfusion.

4 Conclusions

Based on the research, it can be known that 14 blood samples were Igg reactive of *Toxoplasma gondii* and 11 samples were non-reactive. The daily behaviours have relationship on toxoplasmosis cases on blood donors.

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