

Frequency of TORCH infection among the donor population in the republican center for blood transfusion

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Abstract. In this study, we analyzed the frequency of TORCh infections (CMV, toxoplasmosis, rubella and herpes viruses) among donors at the Republican Blood Transfusion Center. This finding is useful for understanding the prevalence of TORCh infections among donors. Among donors, this study was conducted for the first time. To determine the presence of TORCH infection in the blood serum, enzyme-linked immunosorbent assay (ELISA) was performed, and specific IgG antibodies (immunoglobulin G) were determined in the blood serum. The presence of IgG antibodies (to a specific disease) indicates a long course of infection and the formation of immunity against it.

1 Introduction

The issues of bloodborne infection are one of the important problems of modern transfusiology. The most important measures are the assessment of the risk of infectious complications in blood transfusion treatment and their prevention. According to WHO recommendations, the use of blood from donors who have not been tested for infections is prohibited. Bloodborne infections include infections of the TORCH group (Andre J. Nahmias, 1971): T (Toxorlasmosis - toxoplasmosis), O (Other Diseases - other infections, i.e. chickenpox, ringworm, chlamydia, gonococcal infection, listeriosis, etc.), R (Rubella - rubella), S (Cytomegaly - cytomegalovirus infection - CMVI) and H (Herpes simplex - infections caused by herpes simplex types 1 and 2) occupy an important place.

The epidemic process of TORCH infections is characterized by the fact that it does not have a certain periodicity, seasonality and cyclical course, and the main target of pathogens is the development of immunodeficiency in humans. As a result of the presence of asymptomatic forms and the impossibility of conducting a comparative diagnosis of clinical forms that pass at lightning speed, TORCH-group infections do not reflect the spread of infections among the population, which makes it difficult to make a targeted decision and carry out preventive and anti-epidemic measures.

Modern laboratory technologies for diagnosing infectious pathology based on immunochemical research methods make it possible to assess the presence and level of specific antibodies, which makes it possible to predict the course of the infectious process

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and epidemic, its dynamics, assessment and consequences (Adieva A.A. et al., 2009; Roberts C et al., 2011).

The causative agent *Toxoplasma gondii* is a protozoan, and its life cycle takes place inside the cells of the host organism. The definitive host of the parasite are infected cats and other felines that shed *Toxoplasma* oocysts in the faeces. Oocysts are resistant to the external environment, and after entering the body of an intermediate host (rodents, birds, livestock, humans), they continue their life cycle, forming pseudo- and true cysts in the muscles and other tissues of the body. Anti-Toxo-IgM appear 2 weeks after infection and can persist for 1 year or more. So its presence is not a clear sign of an acute infection. However, detection of Anti-Toxo-IgM antibodies in women who were initially seronegative (that is, without antibodies to *Toxoplasma gondii*) during pregnancy indicates a new infection and may lead to congenital toxoplasmosis.

In acute, subacute, chronic and latent forms of toxoplasmosis, Anti-Toxo-IgG antibodies to *Toxoplasma* antigen are produced 3-4 weeks after infection. Class G antibodies usually persist for life. They perform a protective function and in most cases prevent re-infection.

Transmission of clinically significant CMV infection is high by blood transfusion or organ transplantation, which means that CMV is transmitted by contact with body fluids [1-10]. In response to the entry of cytomegalovirus (CMV) into the body, a reimmune reorganization develops in the body. The incubation period is from 15 days to 3 months. With this infection, non-sterile immunity occurs (that is, the virus does not completely disappear). Immunity with CMVI is unstable and slow. Exogenous virus may re-infect or latent infection may reactivate. Due to long-term storage in the body, the virus affects the patient's immune system in all parts. The protective reaction of the body is primarily the formation of specific antibodies Anti-CMV-IgM and Anti-CMV-IgG against CMV. A specific antibody is responsible for the lysis of an intracellular virus, and also inhibits its intracellular replication or spread from cell to cell. After primary infection, the patient's serum contains antibodies that react with internal CMV proteins (p28, p65, p150). The serum of recovered patients mainly contains antibodies that react with surface glycoproteins.

The detection of IgM, which has the greatest diagnostic value, is an indicator of the activity of the process, which indicates an acute course of the disease, reinfection, superinfection, or relapse. The appearance of Anti-CMV-IgM antibodies in a previously seronegative patient indicates a primary infection. With endogenous recurrence of infection, IgM antibodies are formed unevenly (usually in very low concentrations) or may be absent. Anti-CMV-IgG antibodies indicate current or past CMVI. The detection of IgG, as well as the detection of primary CMVI, allows you to track the dynamics of patients with clinical signs of infection and retrospective diagnosis. The production of antibodies against CMV slows down in severe CMV infections, as well as in pregnant women and young children. This is manifested by the detection of a specific antibody in a low concentration or the absence of positive antibody dynamics.

Anti-rubella IgM antibodies are determined to diagnose a primary rubella infection. They can be detected 1-3 days after the onset of clinical symptoms, and in most cases their concentration decreases rapidly within 6-8 weeks after the onset of the disease. The presence of IgM antibodies is a sign of a recent infection. Laboratory diagnosis of this infection in pregnant women is carried out to assess the risk of infection of the fetus. It is also important for diagnosing congenital rubella in newborns.

Anti-Rubella-IgG begins to be produced 3-4 weeks after infection and is detected for life after an acute illness and protects against re-infection. An anti-rubella IgG concentration of less than 10 U/mL indicates that exposure to rubella virus is not sufficient to cause clinical signs of the disease. If it exceeds 10 units / ml, then there is immunity. To

confirm a recent infection with the rubella virus (in addition to Anti-Rubella-IgM), it is necessary to determine the titer of Anti-Rubella-IgG in dynamics (with an interval of 2-3 weeks for paired examinations). A significant increase in IgG titers indicates the severity of the process. Positive Anti-Rubella-IgG results should be interpreted with caution when testing cord blood or newborn blood, as specific IgG may be transmitted from mother to fetus through the placenta.

After infection with the herpes virus, the primary marker of infection is formed - Anti-HCV-IgM antibodies, which appear in the blood within 1-2 weeks after the onset of infection. In 10-30% of people, IgM can be detected even when an old infection is reactivated. IgG antibodies are produced during chronic infection with herpes simplex virus type 1 or 2.

Over the past ten years, the attitude towards the herpes simplex virus has changed radically, since now it is not only a dermatological problem, but also affects various organs and its importance in carcinogenesis and secondary infertility has been proven. The role of the virus in diseases of the liver, brain, prostate and other systems is increasing.

Thus, the ELISA method is a sensitive and specific test for the serological diagnosis of the TORCH complex [11, 12].

Purpose of the study. Study of the serological prevalence of TORCH infection among the donor population at the Republican Center for Blood Transfusion.

2 Materials and methods

For this study, blood serum was isolated from 90 donors who voluntarily donated blood from October to November 2022 at the Republican Blood Transfusion Center of the Ministry of Health of the Republic of Uzbekistan. Serum was analyzed for IgG (immunoglobulin G) antibodies against TORCH agents using a commercially available ELISA kit (Manufacturer: OOO NPO Diagnostic Systems, Nizhny Novgorod) according to the manufacturer's instruction. Anti-Toxoplasma IgG antibody titers above 0.294 IU/mL were considered positive. Anti-rubella IgG titers above 0.324 IU/mL were considered positive. Anti-CMV IgG antibody titers greater than 0.327 AU/mL were considered positive. Anti-herpes IgG titers over 0.318 IU/mL were considered positive. The results were qualitatively expressed as positive and negative. The 6 control groups were also evaluated to determine if the results were correct. It was found that the sensitivity of the test is 100%, and the specificity is 99.6%. Seropositive and seronegative analyzes were compared in 96 panels.

3 Results

The analysis consists of 4 test systems and indicates the presence of immunity to the above infections. According to the results of 90 donors, 66 are men and 24 are women. The donors were in the age group from 18 to 60 years. In our study, the overall seropositivity for toxoplasmosis, cytomegalovirus, rubella and herpes was 20 (22.2%), 90 (100%), 88 (97.8%) and 90 (100%) for IgG antibodies, respectively (Figure 1).

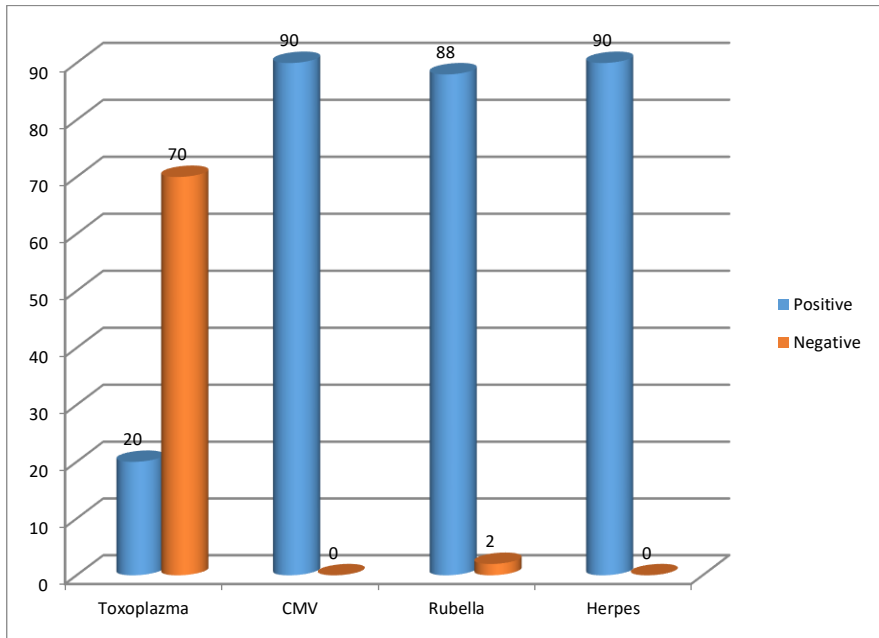


Fig. 1. Seropositivity for TORCH infection in donors (90 cases).

13 (65%) seropositive donors for toxoplasmosis were men and 7 (35%) women, 66 (73.3%) CMV men and 24 (26.7%) women, 64 (71.1%) rubella men and 24 (26.7%) were women, 66 (73.3%) of the herpes simplex virus were men and 24 (26.7%) were women (Table 1).

Table 1. Demographic characteristics of donors by TORCH groups and sex.

TORCH groups	Positive				Zhami		Negative				Total	
	Man		Woman				Man		Women			
	Abs	%	Abs	%	Abs	%	Abs	%	Abs	%	Abs	%
CMV	66	73.3	24	26.7	90	100	-	-	-	-	0	0
Toxoplazma	13	14.4	7	7.8	20	22.2	53	58.9	17	18.9	70	77.8
Rubella	64	71.1	24	26.7	88	97.8	2	2.2	-	-	2	22.2
Herpes simplex	66	73.3	24	26.7	90	100	-	-	-	-	0	0

4 Discussion

In this study, we analyzed the frequency of TORCH infections (CMV, toxoplasmosis, rubella and herpes viruses) among donors of the Republican Blood Transfusion Center. This finding is useful for understanding the prevalence of TORCH infections among donors. Among donors, this study was conducted for the first time. The presence of IgG antibodies (to a specific disease) indicates a long course of infection and the formation of immunity against it. After the infection, IgG remains in the body for life and protects considerably against the next infections. Due to various factors, the exact spread of TORCH infections is still unknown in most parts of the world [13]. The ratio of high-risk seropositive donors in this study was 100%, 22.2%, 97.8%, and 100% for CMV, Toxoplasma, Rubella, and Herpes Simplex, respectively.

Toxoplasma gondii is an intracellular pathogen that is transmitted by a variety of routes, including consumption of raw meat, contact with certain animals, especially cats, and contaminated food or water [4, 7]. In the current study, the positive cases were detected for Anti-Toxo-IgG (22.2%). In addition, the seroprevalence of toxoplasma infections is different in various countries, for example, UK 9.1-7.7% [5], India 28% [7] and Canada 59.8% [5]. This difference in the frequency is likely due to the nutritional habits (consuming well-cooked food and consumption of frozen meat), socioeconomic state, geographical difference, and improved level of health in meat production [1].

Rubella presents as a simple viral disease with mild symptoms or is even asymptomatic in neonates and not common in adults [6].

On the other hand, the prevalence of RUV infection in developed countries has been few due to vaccination programs, but in several countries ranging from 83.4% to 97.9%, for example, India (83.4%) [3], southern Italy (85.8%) [11], Turkey (96.3%) [3] and Nigeria (97.9%) [8]. The results of our study showed that Anti-Rubella-IgG was detected in 97.8% of donors, indicating the success of the vaccination program.

CMV infection is common, with seroprevalence gradually increasing from 65% at 40–49 years of age to 91% at 80 years of age and older, especially in immunocompromised individuals [4]. This pathogen is associated with severe complications and can cause growth retardation, jaundice, hepatosplenomegaly, and intracerebral lesions. CMV is one of the most common viral agents classified in the herpes family. This pathogen can be associated with severe complications that can eventually lead to growth retardation, jaundice, hepatosplenomegaly, and intracerebral damage. The current study indicated that the Anti-CMV-IgG antibody in 100% cases.

One of the important public health problems worldwide is herpes infection. According to some reports, about 325 million persons in the world were infected with this virus [9]. Contact with this infection occurs in most people, as evidenced by the detection of antibodies to HSV 1 and 2 in 80-90% of the adult population. About 80% of people do not know that they are carriers of HSV-2.

5 Conclusion

Sometimes donating blood can save someone's life. People with herpes can also become donors, but only during remission. After all, when the virus is active, it can affect the health of the patient who is transfused with donated blood. This is fraught with pathological processes in the brain, liver, and can also cause allergic reactions and diseases of the organs of vision. However, during remission, the virus is not dangerous. Donation must be approached responsibly. It should be borne in mind that the herpes virus in the carrier's body remains for life, therefore, before donating blood, you must listen to your state of health. It is forbidden to donate biomaterial if the donor with the herpes virus has the following symptoms: general malaise; temperature rise; the manifestation of herpes on the lip or on other parts of the body. The last symptom should be taken seriously. After all, the appearance of sores on the lips or other parts of the body indicates an exacerbation of the infection. In this state, the virus is activated and such a biomaterial can be dangerous for the patient during transfusion. This causes herpetic diseases of the brain, inflammation of the membranes of the eyes (retinitis) or liver (hepatosis), unforeseen reactions to the herpes virus. During the calm period, the virus is localized in nerve cells, it is not in the blood, so there are no obstacles to donation. Remission allows blood transfusion and there is no danger of infecting someone in need of donor material. Before the transfusion procedure, a donor with a herpes infection is obliged to warn health workers about their state of health and be sure to donate blood for analysis. To do this, he signs a paper on the correct provision of information about his health and undergoes research. Whether its raw material

is suitable for donation is finally decided by the polymerase chain reaction (PCR) method. The results of the ELISA method are also important. The analysis helps to determine the state of the immune system and the type of herpes virus. You can become a blood donor with a herpes infection by fully recovering 4 months after infection for the 1st time, and 14 days after an exacerbation. And there are also restrictions on the frequency of biomaterial donation. For people with herpes, blood donation should take place at a frequency of 1 time in 2 weeks. After delivery, heavy physical activity is not recommended. If there are diseases associated with herpes: HIV, tuberculosis, cancer, diseases of the hematopoietic system, donating blood for further use is prohibited. Donors must lead a healthy lifestyle, give up bad habits and monitor their health.

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