Original Article

ANATOLIAN CURRENT MEDICAL

DOI: 10.38053/acmj.1062754

Anatolian Curr Med J 2022; 4(2); 202-205

Rubella, cytomegalovirus and toxoplasmosis seroprevalence in pregnants in Çorum province

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Cite this article as: Kahraman H, Savcı Ü. Rubella, cytomegalovirus and toxoplasmosis seroprevalence in pregnants in Çorum province. Anatolian Curr Med J 2022; 4(2); 202-205.

ABSTRACT

Aim: *Toxoplasma gondii (T. gondii)*, rubella virus and cytomegalovirus (CMV) are important factors that can be transmitted from mother to baby and cause clinical findings in fetus or newborn. In our study, it was aimed to determine the seroprevalence of *T. gondii*, rubella virus and cytomegalovirus in pregnant women who applied to our hospital.

Material and Method: In our study, the serological test results of the blood samples of pregnant women used in the diagnosis of *T. gondii*, rubella virus and CMV infections in Microbiology Laboratory of Hitit University Erol Olçok Training and Research Hospital, were retrospectively analyzed in a five years period between 2016 and 2021.

Results: In our study, when *T. gondii*, rubella virus and CMV test results were examined in pregnant women who applied to our hospital, 18.9% positivity for anti-*T. gondii* IgG, 88.7% for anti-rubella virus IgG and 99.7% for anti-CMV IgG rates have been determined. The positivity of IgM tests of the same agents was determined as 1%, 0.85% and 1.08%, respectively.

Conclusion: Regional epidemiological data are important in terms of determining which of the routine screening approach or the risk of infection factors on the baby will be more important. We think that our study, which includes regional data, will contribute to the literature on this subject.

Keywords: *Toxoplasma gondii*, rubella, cytomegalovirus, pregnancy

INTRODUCTION

While *Toxoplasma gondii (T. gondii)*, rubella virus and cytomegalavirus (CMV) cause mostly asymptomatic or mild symptoms in pregnant women, they can cause serious clinical pictures by passing to the fetus. In order to prevent serious consequences such as fetal anomalies, premature birth, stillbirth and postnatal chronic infections, it is important to diagnose the disease quickly and accurately and to monitor the fetus (1). In addition, awareness of these diseases will enable clinicians to counsel the mother to protect her from these factors, and it will be useful to tell the family about negative fetal outcomes when infection occurs (2).

T. gondii is a protozoan that infects about a third of the world's population. *T. gondii* can be transmitted to humans through food contaminated with oocysts excreted in the feces of infected cats (3). When diagnosing toxoplasmosis, it is important to distinguish between primary and congenital infections correctly. The first approach in screening for infection is to look for IgG and IgM in serum every three weeks. Afterwards, an avidity test should be performed to distinguish between primary infection and congenital infection. Obtaining high avidity shows us that the infection has not been cured in the last four months, while in cases where low avidity is detected, investigating the agent with polymerase chain reaction (PCR) in amniocentesis sample seems to be a method with higher sensitivity (4).

CMV, a human-specific DNA virus from the herpesvirus family, is the most common cause of congenital infections worldwide (5). The rate of CMV congenital infection in newborns varies between 0.2-2.5% (6). It is an important non-genetic leading cause of sensorineural hearing loss and delay in nervous system development in children in developed countries (5). Unlike rubella infection and toxoplasmosis, CMV can produce both primary and post-reactivation/reinfection fetal infection. The rate of transmission varies between 30-40% after primary infection and 1% after secondary infection (7).

Rubella or German measles, caused by the rubella

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Received: 25.01.2022 **Accepted:** 09.03.2022

virus, is characterized by a clinical picture, usually mild, with fever and rash. Rubella, a teratogenic virus, is an important cause of birth defects and fetal death when transmitted during pregnancy. More than 100,000 cases of congenital rubella syndrome (CRS) each year indicate that this infection is an important public health problem (8). If rubella infection occurs in the first 16 weeks of pregnancy, up to 85% of newborns are born with growth retardation and major birth defects known as CRS (9). Serious complications such as blindness, deafness, congenital heart disease, mental retardation, and neurological disorders occur in CRS (8). Since there are no symptoms in half of rubella infections and can mimic many rash diseases, rubella seropositivity cannot be determined based on the patient's history (7).

However, the importance of screening for these factors during pregnancy is a controversial issue. There is no consensus among countries on this issue. In our country, studies have been carried out on the necessity of routine screening of pregnant women, but a consensus has not been reached (10,11).

Inclusion of these factors in prenatal screening programs in a certain geographical region can be determined according to seroprevalence studies and cost analysis studies conducted in this region (12). In our study, we investigated the seropositivity rates of *T. gondii*, rubella virus and CMV in pregnant women and those with suspected pregnancy who applied to our hospital in order to contribute to the seroprevalence in our country.

MATERIAL AND METHOD

Our study was approved by the Hitit University Faculty of Medicine Non-invasive Clinical Researches Ethics Committee (Date: 02.12.2021, Decision No: 2021-85). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

In this study, the blood samples of pregnant women who were sent to the T.C. Ministry of Health Çorum Hitit University Erol Olçok Training and Research Hospital Microbiology Laboratory between 2016-2021 were evaluated. Anti-*T. gondii* IgM and IgG, anti-CMV IgM and IgG, anti-rubella virus IgM and IgG were evaluated retrospectively. The blood sample taken into EDTA tubes was separated into the serum part and studied in accordance with the instructions of the manufacturer for the detection of antibodies using Elecsys® (Roche, Penzberg, Germany) Electrochemiluminescence immunoassay (ECLIA) between 2016-2017 and ARCHITECT® (Abbott, USA) Chemiluminescent Microparticle Immunoassay (CMIA) technique in 2021 studies were performed in accordance with the manufacturer's instructions for the detection of antibodies using the technique. Repeat blood samples sent from the same patient were not included in the study.

RESULTS

In our study, antibody positivity in the blood of pregnant women and women with suspected pregnancy who applied to our hospital, anti- *T. gondii* IgM 1%, anti-rubella virus IgM 0.85%, anti-CMV IgM 1.08%; anti-*T. gondii* IgG 18.9%, anti-rubella virus IgG 88.7%, anti-CMV IgG 99.7% positive (**Table 1**).

Table 1. Antibody distributions of *Toxoplasma gondii*, Rubella virus and citomegalovirus

Toxoplasma gondii	**Positive**	**Intermediate value**	**Negative**
IgM	89/8649 (1%)	29/8649 (0.3%)	8531/8649 (98.6%)
IgG	1739/9199 (18.9%)	101/9199 (1.09%)	7359/9199 (81.9%)
Rubella virus	Positive	Intermediate value	Negative
IgM	76/8921 (0.85%)	70/8921 (0.78%)	8775/8921 (98.3%)
IgG	8176/9210 (88.7%)	194/9210 (2.1%)	840/9210 (9.1%)
Citomegalovirus	Positive	Intermediate value	Negative
IgM	89/8222 (1.08%)	30/8222 (0.36%)	8103/8222 (98.5%)
IgG	410/411 (99.7%)	0/411 (0%)	1/411 (0.24%)

DISCUSSION

It is important to detect *T. gondii*, rubella and CMV infections in the prenatal period because of their serious teratogenic consequences in pregnancy. Today, serological tests take the first place in the identification of these factors in pregnancy follow-up. Detection of specific IgM antibodies in these infections is guiding in the early diagnosis. However, there is no consensus on the routine screening of these infectious agents in pregnant women (13).

T. gondii can be transmitted by eating food that has come into contact with cat feces without washing it well, drinking water, consuming raw and undercooked meat, vertically, blood and organ transplants (14). In vertical transitions, with the progression of the pregnancy period, the risk of developing infection in the fetus increases, while the severity of the disease decreases (4). While screening for *T. gondii* is mandatory in some countries, it is recommended in some countries such as the United States and Canada. Among the factors affecting seroprevalence, there are factors such as gender,

age, immune status, feeding behaviors, keeping cats at home, geographical region differences (15).

In studies conducted in different regions of our country, anti-*T. gondii* IgM positivity rate ranged from 0.4% to 1.1%, while anti-*T. gondii* IgG positivity rate was reported to be between 28.9% and 52.1% (13,16-20). In a meta-analysis examined in pregnant women, the rate of anti-*T. gondii* IgG positivity was 32.9% worldwide, 45.2% in the Americas, 39.7% in the Eastern Mediterranean, 36.5% in Africa, 30% in Europe, 24.6% in Southeast Asia and 11.2% in the Western Pacific. Anti-*T. gondii* IgM positivity was reported at a rate of 1.9% worldwide, with the highest 4.1% in the Eastern Mediterranean, and the minimum 1.1% in the Americas (21). In our study, anti-*T. gondii* IgG positivity rate was found to be 18.9%, lower than other studies. In accordance with these studies in the world and in our country, anti-*T. gondii* IgM positivity was found to be 1%. Anti-*T. gondii* IgM and IgG positivity rate is low, it can be concluded that women should act consciously in contact with animals before and during pregnancy and be careful in consuming raw meat. In addition, we think that institutional and social good practices can be effective in the follow-up, vaccination and shelter services of stray animals.

German measles or rubella; It is a generally self-limiting infectious disease accompanied by fever, lymphadenopathy, maculopapular rash. However, rubella infection in the first trimester of pregnancy can cause fetal death or a condition called congenital rubella syndrome (22).

In studies conducted in Turkey, it has been reported that anti-rubella virus IgM positivity varies between 0.0% and 1.9% (16). In our study, anti-rubella virus IgM positivity was found to be 0.85% similar to other studies. In studies conducted in our country, anti-rubella virus IgG positivity has been reported between 76.5% and 97.3% (16, 18, 19, 23, 24). In our study, anti-rubella virus IgG positivity was similar to the data obtained with a rate of 88.7%.

Rubella vaccine is a live attenuated vaccine that can be administered as a monovalent Rubella vaccine or Measles-mumps-rubella (MMR) and can provide lifelong immunity. Rubella vaccine has been added to the routine vaccination program in Turkey since 2006. Vaccination programs were also thought to have an effect on the high seroprevalence values found in this study and in the literature (25). As seen in our study and other studies conducted in our country, it is thought that the vaccination program contributed to the low anti-rubella virus IgM positivity and the high anti-rubella virus IgG positivity. For this reason, routine vaccination program should be applied completely in order to prevent the risk of congenital rubella syndrome in seronegative girls and expectant mothers of childbearing age.

CMV is a common virus with an approximate seroprevalence of 45% to 100% worldwide (26). Since CMV can remain latent after primary infection, it can be reactivated during pregnancy or transmitted after contact with body fluids (27). Worldwide, congenital CMV infection is the leading cause of neurological damage in children and is associated with growth retardation, hearing loss, permanent disabilities, and microcephaly (28, 29). In studies conducted in our country, anti-CMV IgG positivity ranges between 92.6% and 99.5%. Anti-CMV IgM positivity varies between 1.7% and 2.6% (6, 30-33). In our study, anti-CMV IgG positivity was 99.7%, and anti-CMV IgM positivity was 1.08%, which is similar to other studies conducted in our country.

In conclusion, early diagnosis is important due to the high risk of congenital infections during pregnancy. Serological tests, which are an inexpensive and easy method in the follow-up of pregnant women and who are planning pregnancy, should be performed according to the seroprevalence rates and risk levels of the regions.

ETHICAL DECLARATIONS

Ethics Committee Approval: Our study was approved by the Hitit University Faculty of Medicine Non-invasive Clinical Research Ethics Committee (Date: 02.12.2021, Decision No: 2021-85).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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