ORİJİNAL MAKALE / ORIGINAL ARTICLE

Düzce Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi / DÜ Sağlık Bil Enst Derg
Journal of Duzce University Health Sciences Institute / J DU Health Sci Inst
ISSN: 2146-443X sbedergi@duzce.edu.tr 2020; 10(3): 326-330
doi: https://dx.doi.org/10.33631/duzcesbed.655225

Prevalence of Serum Antibodies to Toxoplasma, Rubella, Cytomegalovirus among Pregnant Women

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ABSTRACT

Aim: Infections during pregnancy are one of the causes of morbidity and mortality for mother and fetus. TORCH are the microorganisms that cause congenital infections. Prevention and treatment of TORCH infection is very important for maternal and child health. In this study, we aimed to determine the seroprevalence of these infections among pregnant women.

Material and Methods: Laboratory data of 1371 pregnant women were evaluated retrospectively. Toxoplasma, Rubella and Cytomegalovirus IgM and IgG antibodies were tested by the carbonylmetalloimmunoassay method.

Results: The ages of pregnant women whose laboratory data were examined, varied between 17 and 47, and the mean age was 30.1 ± 5.2. Positive Toxoplasma IgG antibody was found 36.3%, while 1.0% were positive for the Toxoplasma IgM antibody. Rubella IgG seropositivity was found 94.3%, and Rubella IgM was found 0.7%. CMV IgG and IgM positivities were detected in 94.1% and 0.9% respectively.

Conclusion: Detection of antenatal risk groups is an important step in the prevention of congenital syndromes. Therefore, it is very important to know the seropositivity rates of that region. The common population screening may contribute to the prevention of congenital infections due to TORCH agents. Toxoplasma gondii screening can be recommended because the prevalence is not high. CMV screening is not significant due to high seroprevalence. High anti-rubella IgG seropositivity shows that pregnant women in this region have high immunity levels.

Keywords: Seroprevalence; pregnancy; toxoplasmosis; rubella; cytomegalovirus.

Gebe Kadınlarda Toxoplasma, Rubella ve Sitomegalovirüs Serum Antikorlarının Sıklığı

ÖZ

Amaç: Gebelik esnasında geçirilen enfeksiyonlar anne ve fetüs açısından morbidite ve mortalite nedenlerinden biridir. TORCH konjenital enfeksiyonlara neden olan mikroorganizmalardır. TORCH enfeksiyonunun önlenmesi ve tedavisi, anne ve çocuk sağlığı için çok önemlidir. Bu çalışmada gebe kadınlar arasında bu enfeksiyonların seroprevalansını belirlemeyi amaçladık.

Gereç ve Yöntemler: Toplam 1371 gebe kadının laboratuvar verileri retrospektif olarak değerlendirildi. Toxoplasma, Rubella ve Cytomegalovirus IgM ve IgG antikorları, Carbonylmetalloimmunoassay metodu ile test edildi.

Bulgular: Laboratuvar verileri incelenen gebe kadınların yaşları 17 ile 47 arasında değişmekte olup, yaş ortalaması 30,1 ± 5,2 idi. Toxoplasma IgG antikoru %36,3 pozitif bulunurken, %1 oranında ise Toxoplasma IgM antikoru pozitifti bulundu. Rubella IgG seropozitifliği %94,3 iken Rubella IgM % 0,7 oranında saptandı. CMV IgG ve IgM pozitiflikleri sırasıyla %94,1 ve %0,9 olarak tespit edildi.

Sonuç: Antenatal risk gruplarının saptanması konjenital sendromların önlenmesinde önemli bir adımdır. Bu yüzden öncelikle o bölgeye ait seropozitiflik oranlarının bilinmesi çok önemlidir. Yaygın popülasyon taraması, TORCH ajanları nedeniyle konjenital enfeksiyonların önlenmesine katkıda bulunabilir. Prevalans yüksek olmadığı için Toxoplasma gondii taraması önerilebilir. Yüksek seroprevalans nedeniyle CMV taraması anlamlı değildir. Anti-rubella IgG seropozitifliğinin yüksek olması bu bölgedeki gebelerin bağışıklık düzeyinin yüksek olduğunu göstermektedir.

Anahtar Kelimeler: Seroprevalans; gebelik; toksoplazmozis; rubella; sitomegalovirüs.

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Geliş Tarihi / Received: 04.12.2019, Kabul Tarihi / Accepted: 02.06.2020

INTRODUCTION

Pregnant women are at risk for some infections due to physiological changes during pregnancy. Therefore, the potential effects of infections on both mother and fetus should be considered. Some maternal infections are transferable to the fetus and cause severe complications during pregnancy (1,2). In various stages of pregnancy, maternal infections may be caused by many microorganisms such as *Toxoplasma gondii*, *Rubella virus*, *Cytomegalovirus* (CMV), *Herpes Simplex Virus* (HSV), which are members of the TORCH complex. TORCH infections are significant contributors to prenatal and infant morbidity and mortality. It may cause spontaneous abortions, congenital anomalies, intrauterine growth retardation, prematurity, and intrauterine fetal death, resulting in both economic and social concerns (2). Infection with these agents during pregnancy is one of the causes of morbidity and mortality in terms of both maternal and fetal, especially in developing countries (3). Primary infection with the TORCH complex is initially in apparent or asymptomatic so that it's difficult to diagnose (4). The prevalence rates of TORCH infectious agents may vary from country to country and from region to region (1,5). It has been reported to vary according to occupational groups, climate and environmental conditions, socio-economic situation, prevalence of contact with cats, regional eating habits, and regions in our country and throughout the World (1). Infection transition from mother to baby is usually caused by the mother's infection during pregnancy. The necessity of TORCH screenings for pregnant women in all regions is controversial. It is essential to know the seropositivity rates of the area in this decision (6). Although the prevalence of common congenital infections ranged from 0.1 to 0.01 per 1000 live births, some countries have taken the necessary measures by widespread screening, resulting in a simultaneous reduction in both maternal and congenital infection prevalence (1). Maternal infections usually show a mild or asymptomatic course during pregnancy. Therefore, the detection of antibodies by serological tests is the best approach to diagnose infection (2,3). The serological test screening during pregnancy is of great importance in terms of ending the risky birth and provides the necessary measures for seronegative cases. This study aimed to investigate the prevalence of antibodies against TORCH group agents in pregnant women in our region.

MATERIAL AND METHODS

Ethical approval

Before commencing the study, approval was obtained from Istanbul Memorial Hospital Medical Clinical Research Ethics Committee (No: 2018 / 7- 3). The study was carried out in accordance with the Helsinki Declaration Principles.

Study design and setting

The data of 1371 pregnant women aged 17 - 45 who applied to our hospital due to pregnancy follow-up were evaluated for TORCH agents. Between January 2013 to January 2018, **Laboratory data of pregnant women** were tested for antibodies against *Toxoplasma gondii, Rubella and CMV* in Maltepe Medical Center Microbiology Laboratory. The records of pregnant women in their first trimester were included in the study. Clinical data and demographic characteristics of patients were analyzed retrospectively. The patients who had a lack of medical information were excluded from the study.

Detection of antibodies

Anti-Toxoplasma, anti-rubella and anti-CMV IgM and IgG antibodies were assayed using the Carbonylmetalloimmunoassay method (Abbot, Architect i1000 SR Illinois, USA) using Abbott kits (Abbott, USA) according to the manufacturer's recommendations.

Statistical Analysis

The analysis of the data was performed using the SPSS software package (17.0, SPSS Inc. Chicago, Illinois, USA). Frequencies, percentages, mean, and mean±standard deviations were calculated. Each TORCH agent is individually in itself evaluated by age groups. Relationships between the categorical variables were evaluated by Z-two proportion test, p values less than 0.05 were considered statistically significant.

RESULTS

The ages of the pregnant women included in the study ranged between 17 and 47, and the mean age was 30.1 ± 5.2 years. TORCH tests were performed on a total of 1371 pregnant women. Seropositivity of Toxoplasma IgG 36.3 %, rubella IgG 94.3 % and CMV IgG 94.1%, were detected in patients. Seropositivity of Toxoplasma Ig M 1.0 %, rubella Ig M 0.7 % and CMV Ig M 0.9% were detected in patients (Figure 1).

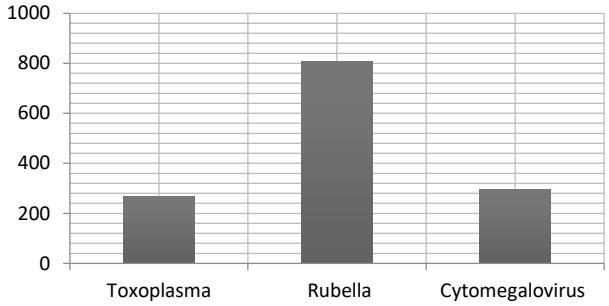

Figure 1. Number of TORCH seropositive cases in pregnant women

A total of 63.8% patients were seronegative for toxoplasma. A total of 5.7 % patients were rubella IgG seronegative, while CMV IgG seronegativity was 5.9% in patients. Table 1 presents TORCH seropositivity and seronegativity among pregnant women.

Table 1. Status of serum antibodies to Toxoplasma, Rubella and Cytomegalovirus in pregnant women

TORCH (n)	Age Groups (Year)		
	17–25	26–35	36–47
	Positive (n %)	Positive (n %)	Positive (n %)
Toxoplasma (n=268)	33(12.3)	167(62.3)	68 (25.4)
Rubella (n=808)	117(14.5)	505(62.5)	186 (23.0)
CMV (n=295)	21(7.1)	207(70.2)	67(22.7)
Total (n=1371)	169	878	324

When we evaluate the TORCH agents according to the age group, patients in the 26-35 age group appear to be affected by infections in terms of all factors. There was a statistically significant difference between the age groups in terms of seropositivity prevalence (p<0.001 Table 2).

Table 2. The distribution by age groups of seropositive patients

	Positive (n %)	**Negative (n %)**	**Total Test**
TOXO IgM	9 (1.0)	868 (99.0)	877
TOXO IgG	259 (36.3)	455 (63.7)	714
RUB IgM	4 (0.7)	560 (99.3)	564
RUB IgG	804 (94.3)	49 (5.7)	853
CMV IgM	4(0.9)	439 (99.1)	443
CMV IgG	291(94.1)	18 (5.8)	309

Rubella Ig G was negative in 49 pregnant women. Rubella IgG seronegativities also differed between age groups (p<0.001 Figure 2).

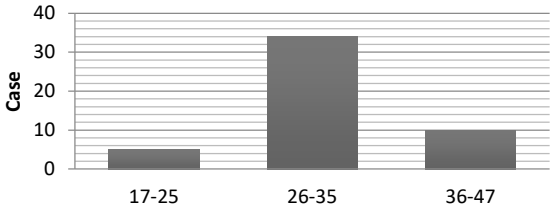

Figure 2. The distribution by age groups of Rubella IgG seronegativity (n=49)

DISCUSSION

Infection during pregnancy is one of the causes of morbidity and mortality in terms of both maternal and fetüs. Perinatal and postnatal infections can lead to a number of medical problems and lifelong neurological deficits. Early diagnosis of these infections is essential in providing the appropriate medical specialist and providing treatment for patients in whom treatment is possible. Because neurodevelopmental problems are common sequelae for most infections, early intervention is essential.

TORCH infections are playing a critical role during pregnancy and major contributors to prenatal and infant morbidity and mortality (1,2). TORCH complex members other than HSV are maternal infections that can be transmitted in the uterus at different stages of pregnancy. The majority of HSV infections are not congenital. In other words, HSV infections occur as a result of exposure to genital secretions at birth. The vertical transition for other agents is transplacental (1,5,6). TORCH agents may cause irreversible damage to the fetus while the mother has an asymptomatic or mild infection. As these maternal infections are initially asymptomatic, the diagnosis of these infections depends on serological evidence. With these serologic tests, infection due to these pathogens can be detected early and contribute to prevent fetal damage. Perinatal infections constitute 2% to 3% of all congenital anomalies (1,2).

Toxoplasma gondii which is one of the TORCH group infection factors is different seropositivity rates in pregnant women due to climate variability, community culture, different dietary habits and living standards (4). The infected pregnant women are generally asymptomatic. During pregnancy, It can cause congenital anomaly, stillbirth, miscarriage, and preterm labor (1,2). It is estimated that 20 to 90% of the adult population in the world has already been in contact with *T. gondii*. The importance for humans is the occurrence of this infection during pregnancy (6). The incidence of congenital toxoplasmosis is reduced by early diagnosis and maternal treatment (7). In our study, we determined the anti-Toxoplasma IgG and anti-Toxoplasma IgM seropositivities in pregnant women as 36.3% and 1.0%, respectively. According to different studies conducted in Turkey, anti-toxoplasma IgG positivity was found between 30.1% and 69.5% (6,7-9). The overall rate of seropositivity for T. gondii antibodies has been reported to reach as high as 85% In Turkey (11). In recent research in Istanbul, toxoplasma seropositivity was detected between 31% and 26.3% in pregnant women (7,9). Toxoplasmosis prevalence varies in different parts of the world. The seroprevalence of *T. gondii* infections ranges between 7.7% and 76.7% in worldwide. While this rate varies between 8.1% and 40% in European countries, it is 22.5% and 15% in the United States. (10,11). The high seroprevalence of *T. gondii* in our country is the presence of numerous stray cats in both rural and urban areas. Also, it depends on the consumption of a large amount of raw wild vegetables, salad, and meat in Turkey. The awareness of hygiene measures and to take preventive measures for toxoplasmosis in seronegative pregnant women is essential since very little can be done when pregnant women have toxoplasma infection.

Maternal rubella infection can lead to congenital rubella syndrome. It may cause cardiac, ophthalmological, neurological, hepatic, hematological, dermatological various anomalies, intrauterine growth retardation, premature labor, and abortion (1-3). Congenital rubella syndrome is a significant cause of deafness, blindness, and mental retardation. Primary prevention is possible through pre conceptional vaccination (12,13). The prevalence of Rubella infection in pregnant women can vary from country to country, and even across regions in the same area. In the meta-analysis study, the prevalence of pooled rubella seronegativity was found to be 9.3%, and this rate was 9.4% for pregnant women. World Health Organization estimates show that the incidence of rubella seronegative ligaments in countries is higher than the results of our study. WHO estimates show that this ratio is 45% in Turkey (14). Rubella IgG and IgM it has been demonstrated rates were 94.87% and 0.783%, respectively for pregnant woman in the meta-analysis study in Turkey (15). A recent study in Turkey shows that seropositivity for anti-rubella IgG and IgM were 89 and 0.19%, respectively (16). In our study, we determined the Rubella IgG and IgM seropositivities in pregnant women as IgG 94.3% and IgM 0.7%, respectively. Rubella vaccination program in Turkey in 2006 was included in the national childhood immunization program (7). This is why rubella IgG was seronegative vary among age groups. Despite immunization in childhood, there are still unvaccinated women in the age of childbearing.

CMV is transmitted by direct contact with body secretions. It can cause intrauterine growth retardation, accompanied by anomalies of the brain and skull. It can also cause cognitive impairment, impaired hearing, and vision in childhood (1,2). The estimated average seroprevalence for women of reproductive age was 86% worldwide, 92% in the Eastern Mediterranean region, and 70% in the European area. The estimated mean seroprevalence for women of reproductive age was 97% in Turkey (17). İn research conducted in various regions of Turkey, the rate varies between 98.2% 92.6% in pregnant women (18). In our study, this rate was determined as 94.1%, and this result was consistent with the literature. Pregnant women need to be trained about strict hygiene practices to prevent congenital CMV infection. Also, prenatal screening for CMV in this region will help in early diagnosis and correct treatment of infection.

CONCLUSION

In conclusion, further studies such as our study are needed to document the seroprevalence of TORCH infections to generate primary data in Turkey. Determining the epidemiology of TORCH infections is an important factor in developing strategies for the prevention of congenital infection. Serological screening before pregnancy is critical to reduce the morbidity and mortality caused by these agents. Although serological testing of TORCH agents is performed routinely in pregnant women, it is not possible to reach all pregnant women due to different socio-economic conditions. Conventional population screening can prevent congenital infections so that contributing significantly to maternal and child health. The results of our study will guide perinatologists, public health experts, and health policymakers on a regional basis. This study will also contribute to generate a primary database in the country.

ACKNOWLEDGMENTS

Due to their contribution to the data preparation process, the authors would like to thank the employees of Maltepe Medical Center Microbiology Laboratory and data processing center employees.

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