Seroprevalence rates of Toxoplasma gondii, Rubella, Cytomegalovirus among first trimester pregnant women in Istanbul

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INTRODUCTION

There are some infectious agents which can complicate both mother and fetus during pregnancy. Toxoplasma gondii, Rubella, and Cytomegalovirus (CMV) are among the most common causes of congenital infections worldwide.1 Toxoplasma gondii is a kind of intracellular parasitic protozoa that may cause congenital toxoplasmosis when transmitted to a fetus transplacentally.7 Congenital toxoplasmosis may be either asymptomatic or symptomatic with the association of various clinical manifestations such as intrauterine fetal loss, hearing loss, chorioretinitis, hydrocephalus, microcephaly, and seizures.3 Rubella is an infectious agent that infected people by inhalation of infected particle and belongs the RNA virus family. Congenital rubella syndrome can result in miscarriage, sensorineural hearing loss, ocular defects, including cataracts, glaucoma, retinopathy, and microphthalmia, various heart defects, and mental retardation.1 In perinatal period, CMV is the most common viral infection and leads to congenital CMV infection. Congenital CMV infection is the most common reason for non-hereditary hearing loss.
in the world besides also can cause microcephaly, chorioretinitis, seizures, growth restriction.\(^4\)

There is no consensus on whether it is necessary to screen for infectious agent during the pregnancy. The seropositivity rates of the population should be known for deciding to routine screening of these infections in the population. In this study, we aimed to investigate the seroprevalence of Toxoplasma, Rubella, and CMV infections through antenatal screening.

**METHODS**

This study was performed on 1309 ambulatory pregnant patients who applied to the obstetric clinic of a university hospital between October 2016 and April 2018. Documents of patients in the first trimester were retrospectively reviewed and serologic data of Toxoplasma gondii, CMV, Rubella infections were retrieved from the computer database. The study was approved by the local ethics committee and was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants. Toxoplasma gondii, CMV, Rubella IgG, and IgM antibodies were analyzed using an enzyme-linked immunosorbent assay (ELISA) method. All reactive samples were repeated in duplicate for IgM tests and accepted as positive.

**Statistical analysis**

Statistical Package for Social Sciences version 17.0 (SPSS Inc., Chicago, IL, USA) software was used for calculating descriptive statistics. Data were presented as mean ± standard deviation. Categorical variables were presented as frequencies and/or percentages.

**RESULTS**

In our study, high rates of immunity against Rubella and CMV but low rates of immunity against toxoplasma was found. The rates of seropositivity show variations on different region of Turkey. The mean age and gestational week of women were 28.3±5.1 years and 11.4±1.5 weeks, respectively. The rates of seropositivity for Toxoplasma, Rubella, and CMV IgG and IgM are shown in Table 1. After assessment of 1309 pregnant women; 352 (26.9\%) pregnant women had positivity for anti-Toxoplasma IgG antibody, 17 (1.3\%) of pregnancies were positive for the anti-toxoplasma IgM antibody, and 10 (0.2\%) of pregnancies were positive for both anti-toxoplasma IgG+IgM antibodies. The rates of seropositivities in the pregnant women for anti-rubella IgG, IgM and IgG+IgM were 1147 (87.6\%), 1 (0.1\%) and 1 (0.08\%), respectively. The seropositivities of the pregnant women for anti-CMV IgG, IgM, and both IgG+IgM were 1163 (88.8\%), 17 (1.3\%), and 17 (1.5\%), respectively.

**DISCUSSION**

Toxoplasma seropositivity rate is associated with sociocultural and nutritional habits, geographic climatic variations, frequency of contact with cats.\(^3\) There is an inverse ratio between risk of fetal transmission and the gestational age, from less than 15\% at 13 weeks of gestation to greater than 70\% at 36 weeks.\(^6\) Approximately 1.5 cases per 1000 live births has congenital toxoplasmosis. Although 90\% of congenital toxoplasmosis cases remain asymptomatic, whenever a fetal infection is confirmed, treatment should be considered with pyrimethamine sulfadiazine and folinic acid, and spiramycin.\(^7,3\)

<table>
<thead>
<tr>
<th>Type of pathogen</th>
<th>IgM positive, n, %</th>
<th>IgG positive, n, %</th>
<th>IgG negative, n, %</th>
<th>IgG+IgM positive, n, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxoplasma gondii</td>
<td>17, 1.3</td>
<td>352, 26.9</td>
<td>737, 56.3</td>
<td>10, 2.8</td>
</tr>
<tr>
<td>Rubella</td>
<td>1, 0.1</td>
<td>1147, 87.6</td>
<td>23, 1.8</td>
<td>1, 0.08</td>
</tr>
<tr>
<td>CMV</td>
<td>17, 1.3</td>
<td>1163, 88.8</td>
<td>2, 0.2</td>
<td>17, 1.5</td>
</tr>
</tbody>
</table>

**Table 2: Results of studies evaluating toxoplasma, rubella, CMV seropositivities in the Istanbul region.**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Interval</th>
<th>Toxoplasma IgM (%)</th>
<th>Toxoplasma IgG (%)</th>
<th>Rubella IgM (%)</th>
<th>Rubella IgG (%)</th>
<th>CMV IgM (%)</th>
<th>CMV IgG (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dogan et al(^4)</td>
<td>2008-2013</td>
<td>0.8</td>
<td>31.4</td>
<td>0.2</td>
<td>95.7</td>
<td>0.8</td>
<td>99.3</td>
</tr>
<tr>
<td>Karacan et al(^5)</td>
<td>2009-2013</td>
<td>0.4</td>
<td>23.1</td>
<td>0.5</td>
<td>95</td>
<td>0.4</td>
<td>84</td>
</tr>
<tr>
<td>Keskin et al(^6)</td>
<td>2011-2013</td>
<td>0.9</td>
<td>31.2</td>
<td>0.1</td>
<td>95.7</td>
<td>0.7</td>
<td>99.3</td>
</tr>
<tr>
<td>Numan et al(^7)</td>
<td>2013-2015</td>
<td>0</td>
<td>31</td>
<td>0.2</td>
<td>94.2</td>
<td>0.5</td>
<td>99.5</td>
</tr>
<tr>
<td>Present study</td>
<td>2016-2018</td>
<td>1.3</td>
<td>26.9</td>
<td>0.1</td>
<td>87.6</td>
<td>1.3</td>
<td>88.3</td>
</tr>
</tbody>
</table>

Pappas et al reviewed the seroprevalence data on pregnancy/childbearing age from different part of the world and reported a range between 10\% and 75\%, especially high prevalence exist in Latin America, parts of Eastern/Central Europe, the Middle East, parts of south-east Asia and Africa.\(^8\) In this study, we found a seropositivity rate of 26.9\% for Toxoplasma gondii. In different regions of Turkey Toxoplasma seropositivity
rate changes between 18.3% and 60.4%. While in the southeastern part of Turkey, such as in Sanliurfa, Hatay, Adiyaman, Kahramanmaras, seropositivity rates are 60.4%, 52.1%, 48.4%, 47.1% respectively, in the western part of Turkey, such as in Usak, this rate is 18.3%.9-13 Toxoplasma seropositivity rates were found 31.4%, 23.1%, 31.2%, 31% in other studies which also from Istanbul region (Table 2).14-17

Seroprevalence of Toxoplasma was higher in the eastern part of Turkey than in the western parts because the Turkish diet in the eastern part of Turkey consists of large amounts of raw vegetables and undercooked meats. Women especially those who were seronegative during pregnancy, should be educated in nutrition and hygiene habits. However, Mario Di et al reported in their meta-analysis that there is little evidence from randomized controlled trials about the effectiveness of prenatal education for reducing congenital toxoplasmosis even though observational studies suggest it is.18

The risk of vertical Rubella transmission is 80-100% in the first trimester, 10-20% in the second trimester, and with an increase up to 60% at term rubella virus causes severe defects in fetus by cellular damage on dividing cells.19 Due to high transmission risk in the first trimester from a nonimmune mother, screening of seronegative women before pregnancy is important. Immunization should be offered to these women at the preconceptional period against the Rubella virus. The routine vaccination program was started in 2006 in Turkey by the Ministry of Health and Social Welfare. We found the 87.6% seropositivity rate for Rubella. Different seropositivity rates were detected in Van (99.5%), Hatay (95%) and, Edirne (76.6%).20,10,21 The rates differ 94.2%-95.7% in the Istanbul region (Table 2). Our data belongs to ten years later from the vaccine that was introduced into National Vaccination Calendar. In our study, we detected 23(1.8%) pregnant women with Rubella seronegativity. These data demonstrated that even national vaccination program has achieved success, we are still able to meet seronegative pregnant women because such women are neither vaccinated nor exposed to the virus. We agree that seronegative women at reproductive age should be screened and vaccinated before pregnancy.

CMV infection is the most common intrauterine infection which causes more severe damage if exposed during the first trimester of pregnancy.2 The rate of symptomatic disease in infected neonates at birth is approximately 10%, 15% of the infected neonates develop late sequelae.22 We found in this study that 1.3% CMV IgM positivity rate and 88.8% CMV IgG positivity rate that is comparable with other results from the Istanbul region (Table 2). These rates were found in 0.1–3.2% and 80.3–99.8% in several reports from different regions of Turkey.23 The rate of CMV seropositivity varies widely in the world. The rate is higher in findings of our present study than some countries in Europe such as France, Finland (53.1%, 56.3% respectively) but, lower than Iraq where the seropositivity rate reported as 100%.24-27 And another study which was performed in Turkey, Gun et al found seropositivity of IgG/IgM antibody for CMV, rubella and toxoplasma gondii that were 73.3%/3.7%, 90%/0.6%, 31.5%/2.0% respectively.28 Pregnant women are in a risk group if they have in a close and long-term relationship with children under the age of three. Hygiene rules should be advised to especially seronegative pregnant women in the risk group.

There are several limitations to this study. Retrospective study design and inadequate data about patients' socioeconomic and educational status, dietary habits, and neonatal outcomes in patients with suspected acute infection are among these limitations.

CONCLUSION

We detected high rates of immunity against Rubella and CMV but low rates of immunity against Toxoplasma in this retrospective cohort of pregnant women in accordance with the results of other studies from Istanbul and different regions of Turkey. This information may enlighten for the argument against routine nationwide screenings for Rubella and CMV infections during pregnancy. Due to cost-effectiveness issues targeted serology should be considered on a case by case basis. Routine screening might be more appropriate only in high-risk groups.

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Ethical approval: The study was approved by the Institutional Ethics Committee (167259 Dated 03.05.2017)

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