The Screening of Rubella Virus, Cytomegalovirus, Hepatitis B Virus, and Toxoplasma gondii Antibodies in Prepregnancy and Reproductive-Age Women in Tabriz, Iran

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Objectives. The organisms of Toxoplasma gondii, Rubella virus, Cytomegalovirus, and Herpes simplex virus as an acronym of TORCH are major pathogens in prepregnancy and reproductive-age women. These microorganisms are considered a serious problem and cause 2-3% of all birth defects in the fetus. Our study was aimed at screening the seroprevalence of TORCH antibodies among prepregnancy and reproductive-age women in Tabriz, Iran.

Design and Setting. This study was carried out in 2726 prepregnancy and reproductive-age women, who were referred to the laboratory for prenatal TORCH screening. To detect the presence of IgG, IgM antibodies and Hepatitis B surface antigen against these microorganisms were carried out using a chemiluminescence immunoassay analyzer (CLIA).

Results. In the current study, the rates of anti-Toxoplasma gondii IgG, anti-Rubella virus IgG, and anti-Cytomegalovirus IgG were found in 722 cases (26.5%), 2579 cases (94.6%), and 2718 cases (99.7%), respectively. Moreover, the rates of anti-Toxoplasma gondii IgM, anti-Rubella virus IgM, and anti-Cytomegalovirus IgM were discovered in 10 cases (0.4%), 13 cases (0.5%), and 16 cases (0.6%), respectively. The Hepatitis B surface antigen was found in 32 cases (1.2%).

Conclusions. In our study, the seroprevalence of acute TORCH infections was relatively low. Due to the probability of vertical transmission to the fetus during pregnancy and the unpleasant complication of these pathogens, it is essential to be screened for detection of specific IgG and IgM antibodies in reproductive ages.

1. Introduction

The infections of Toxoplasma gondii (TOX), Rubella virus (RUV), Cytomegalovirus (CMV), and Herpes simplex virus (HSV), as an acronym of TORCH, are major pathogens with serious problems in prepregnancy and reproductive-age women. They are considered to cause 2-3% of all birth defects in the fetus. Moreover, the letter “o” of TORCH as an abbreviation that refers to others can include some pathogen agents such as Arbovirus B19, Hepatitis B virus (HBV), Varicella-zoster virus, human immunodeficiency virus, and Zika virus [1, 2]. The seroprevalence of these infections is different in various geographical areas [3]. Disease caused by TOX is generally with no sign and with mild infection in healthy individuals, and it may lead to serious problems in the fetus, which result in stillbirth, blindness, and mental retardation [4]. Rubella appears as a simple disease with mild symptoms and usually no specific complication. Despite these findings, whenever it occurs in a prepregnancy and reproductive-age woman, it can cause death and abortion [5]. CMV is one of the most common viral agents causing infection in utero, and its prevalence has been estimated at 0.3-2.4% of all successful deliveries. Infection due to CMV can be associated with severe complications that can eventually lead to growth retardation, jaundice, hepatosplenomegaly, and intracerebral damage [6, 7]. Viral hepatitis caused
by some viruses such as *Hepatitis B virus* is a common form of the disease worldwide. Chronic hepatitis patients can transmit the virus for years without any symptoms. Prepregnancy and reproductive-age mothers are believed to be the most important risk factor for transmitting the virus to the fetus. Nowadays, to screen HBV infections in prepregnancy and reproductive-age women, the HBsAg test is recommended [8]. It is a normal initial detection of the TORCH pathogen which is important for treatment and prevention strategies for adverse fetal outcomes [9]. The characteristic of these pathogens is that they are asymptomatic at the beginning of the infection, and they cannot be diagnosed based on their clinical features. The tracing of the IgM antibody against TORCH pathogens is the best aspect of the recognition of these infections [10]. This study was aimed at screening the seroprevalence of TORCH infections among prepregnancy and reproductive-age women in Tabriz.

### 2. Materials and Methods

#### 2.1. The Patients. This study was carried out on 2726 prepregnancy and reproductive-age women, who were referred to the laboratory for prenatal screening in Tabriz, Iran, from 2018 to 2020. Awareness consent was received from all women who were referred to screening for TORCH. Blood samples were collected from each person and were centrifuged at 1200 × g for 15 min to separate the serum from the blood.

#### 2.2. The Screening. To detect the presence of anti-CMV, TOX, RUV IgG, and IgM antibodies and also HBsAg, the serologic testing was carried out using a chemiluminescent immunoassay (Liaison® XL, Italy). According to the manufacturer’s instructions (Liaison Company, Italy), the analysis of the test results was carried out based on the cut-off activity index. Additionally, the quality control process of the device and kits was performed according to the relevant standards.

#### 2.3. Statistical Analysis. Statistical analysis was carried out by SPSS 26 (SPSS Inc., Chicago, Illinois, US).

### 3. Results

To determine the seroprevalence of TORCH, this study was conducted in 2726 cases of reproductive-aged women. The mean age of women was 30 ± 7 years old (range 14-45). As shown in Table 1, all women based on age were divided into three categories, and the seroprevalence of TORCH was determined in each category. The distribution of positive

### Table 1: The seroprevalence of TORCH IgG and IgM among 2726 women who categorized based on age.

| Pathogen | Age group | IgG | IgM | IgG | IgM | IgG | IgM | IgG | IgM | IgG | IgM | IgG | IgM |
|----------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|          | 14-24 y (653 cases) | P   | N   | P   | N   | P   | N   | P   | N   | P   | N   | P   | N   |
|          |           | 109 | 544 | 0   | 653 | 545 | 108 | 2   | 651 | 648 | 5   | 6   | 647 |
|          | 25-35 y (1361) | 353 | 1008| 8   | 1353| 1339| 22  | 11  | 1350| 1358| 3   | 10  | 1351|
|          |           | 260 | 452 | 2   | 712 | 695 | 17  | 0   | 712 | 712 | 0   | 0   | 712 |
|          | 36-45 y (712) |     |     |     |     |     |     |     |     |     |     |     |     |

### Table 2: The seroprevalence of tested TORCH pathogens among 2726 women.

| Pathogens | IgG | IgM |
|-----------|-----|-----|
| TOX       | 722 | 2004|
| RUV       | 2579| 147 |
| CMV       | 2718| 8   |

TORCH in various ages was different (P < 0.05). The rate of anti-TOX IgG antibody, anti-Rubella IgG, and anti-CMV IgG were found in 722 cases (26.5%), 2579 cases (94.6%), and 2718 cases (99.7%), respectively. Moreover, the rate of anti-TOX IgM antibody, anti-Rubella IgM, and anti-CMV IgM was discovered in 10 cases (0.4%), 13 cases (0.5%), and 16 cases (0.6%), respectively. The seroprevalence of HBsAg *Hepatitis B virus* (HBsAg positive) as other pathogen-related to TORCH was in 32 (1.2%) cases. The seroprevalence of tested TORCH pathogens among 2726 women is shown in Table 2.

### 4. Discussion

Intrauterine infections related to TORCH pathogens can lead to serious fetal complications, despite most of these organisms not being associated with a serious injury in the mothers and appearing often as a mild conflict. Conventional screening via serological assays is effective in the detection of TORCH infections, before pregnancy, prepregnancy, and reproductive-age women. In this investigation, we had analyzed the seroprevalence of TORCH agents (TOX, RUV, CMV, and *Hepatitis B virus*) among prepregnancy and reproductive-age women in Tabriz, Iran. This issue is helpful for the understanding of the diverse TORCH agents spreading in this area. The strength of our research may be a high sample size over a short study period of two years, and it was conducted for the first time in this geographical area. The weakness of our work may be the lack of full patient’s follow-up, which will be pursued in the future and lack of definitive confirmation of positive cases by amniocentesis sampling. Due to various factors, the exact spread of TORCH infections is still unknown in most parts of the world [2]. In the present study, acute infections due to TOX, CMV, and RUV were 0.4%, 0.5%, and 0.6%, respectively. *Toxoplasma gondii* is an intracellular pathogen that is transmitted in a variety of ways, including consuming uncooked meat, contact with some animals especially cats, and contaminated foodstuffs or water. Disease caused by this
In our study, the seroprevalence of acute TORCH infections was relatively low. Due to the probability of vertical transmission to the fetus during pregnancy and the unpleasant complication of these pathogens, it is essential to be screened by detection of specific IgG and IgM antibodies in reproductive ages.

5. Conclusion

In our study, the seroprevalence of acute TORCH infections was relatively low. Due to the probability of vertical transmission to the fetus during pregnancy and the unpleasant complication of these pathogens, it is essential to be screened by detection of specific IgG and IgM antibodies in reproductive ages.

Data Availability

The data used to support the findings of this study are included in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors’ Contributions

Reza Ghotaslou conceived and designed the study; Edris Nabizadeh, Anahita Ghotaslou, and Reza Ghotaslou initiated the comprehensive research and analyzed the data; Anahita Ghotaslou, Behnaz Salahi, Edris Nabizadeh, and Reza Ghotaslou wrote and revised the paper. All authors read and approved the manuscript.
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