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Original Article

The Prevalence of Serum antibodies in TORCH Infections during the First Trimester of Pregnancy in Kashan, Iran

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ABSTRACT

***Background*:** TORCH infections are caused by Toxoplasma gondii and other microorganisms such as Treponema pallidum, the Rubella virus (RV), Cytomegalovirus (CMV) and the Herpes Simplex Virus (HSV) Type I and II during the first trimester of pregnancy. They might lead to severe fetal anomalies or even fetal loss. The current study aimed to determine the serological data of TORCH infections in women in their first trimester of pregnancy.

***Methods*:** This descriptive study was conducted on 80 pregnant women who were in their first trimester in Kashan, Iran. To detect the specific IgM and IgG antibodies against the TORCH infections, sera were collected from these women by ELISA.

***Results*:** The specific IgG antibodies were found to be positive for toxoplasmosis in 30 cases (37.5%), for the Rubella virus in 74 (92.5%), for CMV in 79 (98.8%) and for the HSV Type I and II in 73 cases (91.3%). Moreover, 3.8% of the cases were found to be seropositive for Toxoplasma IgM antibody (95% CI, 0.38-7.9), 5% were positive for CMV IgM antibody (95% CI, 0.23-9.77) and 7.5% were positive for the HSV IgM antibody (95% CI, 1.8-13.2). Finally, it was observed that 63.8% of the pregnant women were at the risk of at least one of the TORCH agents.

***Conclusion*:** This study was indicative of a high prevalence of infections caused by TORCH agents among pregnant women. Therefore, national screening programs are crucial to a routine TORCH screen as well as to preventing and treating congenital TORCH infections.

Key Words: Antibodies, IgG, IgM, Pregnant women, TORCH

Introduction

Infections acquired in utero or through the birth process are among the significant causes of fetal and neonatal mortality. Internationally, infections are recognized as the major cause of stillbirths accounting for approximately half of them, especially in developing countries. Some congenitally acquired infections are caused by the TORCH complex Toxoplasma gondii as well as other microorganisms such as Treponema pallidum, the Rubella virus (RV), Cytomegalovirus (CMV) and the Herpes Simplex Virus (HSV) Type I and II (1, 2).

The inadvertent outcomes produced by these pathogens are generally similar to those of abortions, infertility, intrauterine fetal deaths, stillbirths, congenital malformations and reproductive failures (2). The prevalence of TORCH infections varies from one geographical area to another (3). However, countries of the Southeast Asia and Sub-Saharan Africa are reported to have the highest figures of stillbirths (4).

Since such maternal infections are primarily asymptomatic and the clinical diagnoses in this regard are inconsistent (1), it is paramount to identify susceptible women, especially those with acute maternal infections, as well as to recognize the predominant and recurrent infections.

Due to the lack of a national screening program, limited data could be collected from the pregnant women in Kashan mainly describing the seroprevalence of the specific IgM and IgG antibodies to TORCH agents during pregnancy. Therefore, this study aimed to distinguish the serological evidence of acute TORCH infections during the first trimester in the pregnant women in Kashan, Iran.

Method

Participants

A cross-sectional study of seroprevalence was conducted in Kashan, Iran from June 2010 to

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November 2012. The study population consisted of the pregnant women referring to Kashan Reference Laboratory for prenatal screening during their first trimester. Informed consent was obtained from the subjects and the Ethics Committee of Kashan University of Medical Sciences approved the study protocol.

Serology assessment

A total of 80 sera samples were collected for the detection of IgM and IgG antibodies against TORCH agents. About 5 ml of blood was taken from each subject and the blood samples were clotted and centrifuged prior to testing. Afterwards, the samples were tested for IgG via Antibody capture method and for IgM via Indirect ELISA commercial kits (Pishtazteb, Tehran, Iran) in the Serology Section of the Department of Microbiology. The collected sera were tested according to the manufacturer's instructions.

The obtained results were evaluated by ELISA Reader (Awareness, USA). The sensitivity and specificity of the kits, as measured by Chemiluminescence and ELISA reference for IgM and IgG antibodies against TORCH, were 100% and 99%, respectively. The results for IgM antibody were calculated based on the Cutoff Activity Index (COL).

Cutoff Index (COI) = sample OD value/Cutoff value

The obtained values above 1.1 were considered as positive whereas those below 0.9 were taken as negative and the values between 0.9 to 1.1 were recorded as suspicious. The results for IgG antibody were calculated based on the standard concentration. The obtained values above 10 (IU/ml) were considered as positive whereas those below 10 (IU/ml) were taken as negative and those between 9 to 11 (IU/ml) were recorded as suspicious. In addition, syphilis was detected via Rapid plasma reagin (RPR) test (Bionik, Tehran, Iran).

Statistical analysis

The statistical analyses were done using the SPSS software version 17 (SPSS Inc., Chicago, Illinois, USA).

A 95% confidence interval (CI) was estimated for each of the TORCH components in the positive cases.

Results

In the present study, the mean age of the pregnant women was 30±5.2 years. With regard to the prevalence of IgM antibody, 3.8% of the cases were found to be seropositive for Toxoplasma (95% CI, 0.38-7.9). Moreover, all the cases (100%) were proven negative for IgM Rubella while 4 cases (5%) were positive for CMV (95% CI, 0.23-9.77) and 6 (7.5%) were positive for the HSV infections (95% CI, 1.8-13.2).The seropositive rates of IgM antibody in the TORCH infections are shown in Table1.

As for the prevalence of IgG antibody, a total number of 30 cases (37.5%) were found to be seropositive Toxoplasma (95% CI, 26.5-48.1). Furthermore, 74 cases (92.5%) were positive for the Rubella (95% CI, 86.8-98.2), 79 (98.8%) were positive for CMV (95% CI, 96.7-100), 73 (91.3%) were positive for the HSV Type I and II (95% CI, 85.1-97.4) and 80 cases (100%) were negative for the Venereal Diseases Research Laboratory (VDRL). The seropositive rates of IgG antibody in the TORCH infections are shown in Table 2.

The susceptibility rate of TORCH infections in the pregnant women during the first trimester is illustrated in Figure 1.

The age range of women in their first trimester of pregnancy in the TORCH screen is illustrated in Table 3.

Discussion

According to the results of the present study, the specific IgG antibodies were found to be positive for toxoplasmosis in 30 cases (37.5%), for the RV in 74 (92.5%), for CMV in 79 (98.8%) and for the HSV Type I and II in 73 cases (91.3%). Moreover, the specific IgM antibodies were reported positive in 3 cases (3.8%) for toxoplasmosis, in 0 (0%) for the RV, in 4 (5%) for

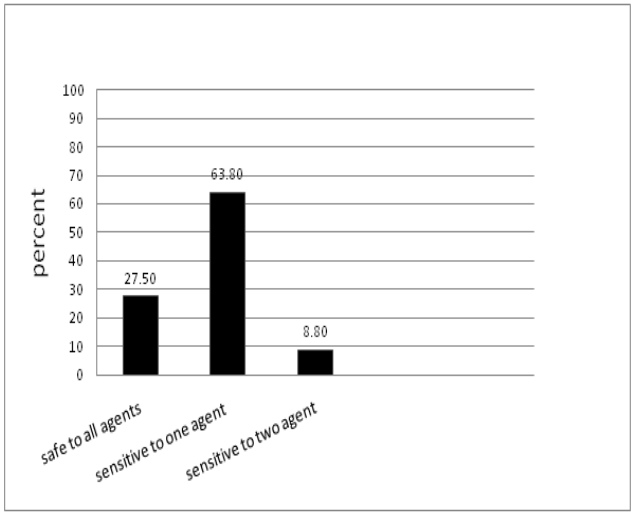

Figure 1. The susceptibility rate of TORCH infections in the pregnant women during the first trimester

Table 1. Serological evidence of specific IgM antibodies against TORCH infections in the first trimester of 80 pregnant women in Kashan

Serological test	No. of positive cases (%)	No. of negative cases (%)	95% Confidence interval
Toxoplasma IgM	3(3.8)	77(96.3)	0.38-7.9
Rubella IgM	0	80(100)	0
CMV [1]IgM	4(5)	76(95)	0.23-9.7
HSV[2]-1,2 IgM	6(7.5)	74(92.5)	1.8-13.2

[1] CMV: Cytomegalovirus virus

Table 2. Serological evidence of specific IgG antibodies against TORCH infections in the first trimester of 80 pregnant women in Kashan

Serological test	No. of positive cases (%)	No. of negative cases (%)	No. of equivocal cases (%)	95% Confidence interval
Toxoplasma IgG	30(37.5)	49(61.3)	1(1.3)	26.5-48.1
Rubella IgG	74(92.5)	4(5)	2(2.5)	86.8-98.2
CMV[1] IgG	79(98.8)	1(1.3)	0	96.7-100
HSV[2]-1,2 IgG	73(91.3)	7(8.8)	0	85.1-97.4

[1]CMV: Cytomegalovirus virus
[2] HSV: Herpes simplex virus

Table3. Positive results of TORCH infection in pregnant women in terms of age

Serological test	age (year)		Odd ratio	95% Confidence interval	*Pvalue*
	<30	≥30			
	No. (%)	No. (%)			
Toxoplasma(IgM)	2(2.50)	1(1.25)	2.05	0.178-23.9	0.56
Toxoplasma(IgG)	11(13.7)	19(23.7)	0.399	0.156-1.01	0.05
Rubella(IgM)	0	0	1.00	0.019-51.6	1.00
Rubella(IgG)	38(47.5)	36(45.0)	3.16	0.314-31.8	0.32
CMV[1](IgM)	2(2.50)	2(2.50)	1.00	0.133-7.47	1.00
CMV(IgG)	39(48.7)	40(50.0)	0.325	0.012-8.22	0.49
HSV[2](IgM)	2(2.50)	4(5.00)	0.473	0.081-2.74	0.40
HSV(IgG)	34(42.5)	39(48.7)	0.145	0.016-1.26	0.08

[1]CMV: Cytomegalovirus virus
[2] HSV: Herpes simplex virus

CMV and in 6 cases (7.5%) for the HSV Type I and II infections. On the other hand, the prevalence of Toxoplasma specific IgM and IgG antibodies were respectively 3.8% and 37.5% in the pregnant women during their first trimester.

Congenital toxoplasmosis occurs all over the world and the prevalence varies geographically posing the risk of primary Toxoplasma infections in women of the reproductive age (5, 6).

The highest infection rates of Toxoplasma gondii have been observed in Europe, Central Brazil, America and Central Africa (7). Accordingly, the prevalence of Toxoplasma gondii was as much as 20.5% in single women of Kashan, Iran (8).

In the current study, RPR results were reported to be negative. Syphilis is a systemic infection caused by a spirochete called Treponema pallidum, which is also a major concern during pregnancy since it is likely to pose the risk of transplacental infection on the fetus. Congenital infection is associated with several adverse outcomes. Syphilis screening and intervention in 500,000 pregnant women in Shenzhen, China showed 2208 out of 477,656 pregnant women (0.5%) to be positive for the disease (9). Nevertheless, Congenital Rubella Syndrome (CRS) is a rare condition in developed countries with established rubella immunization programs (10, 11).

The results of the current study indicated that 92.5% of the pregnant women had IgG antibodies whereas none had rubella IgM. CRS typically occurs in infants whose mothers come from countries without rubella immunization programs. In most of the developing countries, rubella is going uncontrolled and there is a high probability for the occurrence of CRS (ranging from 10 to 90 cases per 100,000 live births) (12-14).

On the other hand, our study revealed the seropositive rate of the CMV specific IgM and the

CMV specific IgG to be 5% and 98.8%, respectively. Another study conducted in 2005 on the prevalence of CMV infection in pregnant women in another city in Iran suggested a seroprevalence rate of 91.94% and 33.8% for CMV-IgG and CMV-IgM, respectively (15).

Another cohort study conducted on the seroprevalence of CMV among pregnant women in Bradford revealed a rate of 49% in the White British women, 89% in South Asian UK-born women and 98% in South Asian women born in South Asia (16). Thus, it could be inferred that CMV is the most frequent congenital viral infection with a birth prevalence of approximately 0.5% (ranging from 0.2% to 2.5%) (17, 18).

The factors responsible for the transmission of congenital CMV infection to the fetus and the severity of the condition require further investigation. Although the pre-existing maternal CMV seropositivity is likely to significantly reduce, it may not be able to eliminate fetal infection completely (19, 20).

The current study indicated the prevalence rate of HSV Type I and II and IgM/IgG antibodies to be 7.5% and 91.3%, respectively. On the other hand, neonatal HSV infection is known to occur in one out of every 3200 to 10000 live births (21-24) leading to severe morbidity and mortality. A seroepidemiology study of the HSV Type II on the pregnant women in Belgium showed 80.3% of the cases to be negative, 1.5% to have equivocal results and 18.2% to be positive (25).

Consistent with our research, a study conducted in the United States suggested that the seroprevalence of HSV-1 and HSV-2 in pregnant women was 63% and 22 %, respectively (26).

Accurate diagnosis of prenatally acquired infections is crucial to the onset of an appropriate treatment. The findings of the present study proved that only 27.5% of the pregnant women were immune to all agents whereas 63.8% of them were at the risk of at least one of the TORCH agents. Thus, adequate knowledge of the epidemiology of the TORCH infections is of paramount importance in the prevention of congenital infections (27).

Conclusion

All women of the reproductive age need to be routinely screened for the TORCH complex in order to avoid undesirable fetal outcomes. The development of a vaccination strategy against TORCH infections, especially in the developing countries, could be a viable and efficient approach in this regard.

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