BRIEF COMMUNICATION

Human parvovirus B19 in Iranian pregnant women: A serologic survey

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ABSTRACT

Background: Parvovirus B19 infection is associated with clinical symptoms that vary in the spectrum from trivial to severe. The important clinical manifestations are erythema infectiosum or the fifth disease, transient aplastic anemia in patients with hemoglobinopathies, acute polyarthralgia syndrome in adults, hydrops fetalis, spontaneous abortion and stillbirth. Acute infection in nonimmune pregnant women can lead to fetal hydrops. In view of the many complications that can result from acute parvovirus B19 infections during pregnancy, documenting the seroprevalence of anti-parvovirus B19 IgG and its association with the history of abortion in an Iranian population of pregnant women would be of value. **Materials and Methods:** Serum samples from 86 pregnant women were collected between May and September 2011 in West Azerbaijan province of Iran. Every pregnant woman completed a questionnaire which included age, history of tattooing, blood transfusion, and abortion. Anti-B19 specific IgG was detected by using commercial enzyme-linked immunosorbent assays. **Results:** Anti-B19-specific IgG antibody was detected in (65/86, 75.6%) of pregnant women. The mean age was 25.56 ± 5.30 years and three women had a documented history of blood transfusion (2 of them tested seropositive for B19). 16/18 (88.8%) of women with a history of abortion were IgG positive. The frequency of abortion sessions in the seropositive group (25 sessions of abortion: 11 women experienced once, 2 twice, 2 thrice and one 4 times) was 4.03 times greater than abortion in seronegative group (2 abortions/21 seronegative women). **Conclusion:** Our study reaffirms previous reports regarding the higher frequency of abortion among anti-B19 IgG seropositive pregnant women and a possible role of this viral infection in the pathogenesis of abortion.

KEY WORDS: Enzyme-linked immunosorbent assays, IgG, parvovirus B19, pregnancy, serology

INTRODUCTION

Parvovirus B19 is a member of the *Parvoviridae* family, genus *Erythrovirus*. It is a naked single-stranded DNA virus and the only known human pathogenic parvovirus.[1] Its genome of about 2500 base pairs encodes for three major proteins. Two structural proteins (VP1 and VP2) make up the viral capsid,[2] and the nonstructural protein (NS1) is presumed to be involved in viral replication, activation of viral gene transcription and inducing apoptosis in target cells.[3]

The infection usually occurs in childhood and the most frequent manifestation of parvovirus B19 infection is erythema infectiosum, also called the fifth disease or "slapped-cheek" disease.[4] However, it can cause a wide variety of clinical manifestations. Since the virus replicates within the nucleus of erythroid precursor cells, the infection is lytic, and it causes a transient cessation of red blood cell production, so it leads to transient aplastic crisis, especially in persons with underlying hemolytic disorders.[5,6]

The virus usually distributes through respiratory droplets; recurrent blood transfusions and immunosuppression are also risk factors for B19 virus infection. Fetal loss results from fetal red blood cell destruction in nonimmune pregnant women.[1]

Infection by parvovirus during pregnancy is not associated with increased risk of fetal malformation. However, infection during pregnancy is an important cause of intrauterine fetal death, stillbirth, and nonimmune hydrops fetalis.[7]

There is a paucity of data regarding the incidence, prevalence and outcomes of B19 infection in Iran; however, we aimed to study the seropositivity of anti-parvovirus B19 IgG in a group of Iranian pregnant women and its association with a previous history of abortion.

MATERIALS AND METHODS

This cross-sectional study was implemented following approval of

Scientific and Ethical Review Board of Urmia University of Medical Sciences, Iran. Eighty-six pregnant women were selected randomly from all districts of Urmia city in West Azerbaijan in consonance with a population of each district. A questionnaire was filled by every participant including demographic information as well as history of tattooing, blood transfusion or any previous abortion or stillbirth. A volume of 5 mL blood sample was collected through venipuncture and serum samples were separated and stored at −20 until testing. Sampling was done between May and September 2011.

Anti-parvovirus B19 IgG was measured by a commercial enzyme-linked immunosorbant assay (Diapro, Italy). The procedure and interpretation of results was carried out as per kit protocol.

All data were analyzed by SPSS statistical software version 16 (SPSS Inc. Chicago, IL). $P < 0.05$ was considered statistically significant.

RESULTS

Eighty-six pregnant women were enrolled randomly in this study, which was aimed to investigate the risk of parvovirus infection among pregnant women and its association with a history of abortion. The mean age was 25.56 ± 5.30 years.

Anti-B19-specific IgG antibodies were detected in 65/86 (75.6%) of pregnant women. Two of three women who had a previous history of blood transfusion tested seropositive for B19. 16/18 (88.8%) of all women who had a documented history of abortion tested positive for IgG.

As statistically documented, it is clear that the frequency of abortion sessions in anti-parvovirus B19 IgG positive women (overall 25 events: 11 women experienced once, two twice, 2 thrice and one for 4 times) was 4.03 times more than the seronegative group (only 2 abortion events amongst 21 pregnancies).

The various differences between seronegative and seropositive groups are as shown in Table 1. As can be seen, anti-B19 IgG seropositive cases were significantly older than the seronegative ones (26.6 ± 5.2 vs. 22.3 ± 3.8; $P = 0.04$).

Table 1: Comparison of the characteristics between seronegative and seropositive groups for antiparvovirus B19 IgG

Characteristics	*Seronegative (n = 21)*	*Seropositive (n = 65)*	*P value*
Age (mean±SD)	22.3±3.8	26.6±5.2	0.04*
Place of birth			
Urban	10	32	0.54
Rural	11	33	
Residency			
Urban	18	59	0.38
Rural	3	6	
Education			
Illiterate	7	23	0.74
Undergraduate	13	39	
Graduated	1	3	
History of blood transfusion	1	2	0.57
History of tattooing	1	3	0.68

SD: Standard deviation

DISCUSSION

Most parvovirus B19 infections occur in childhood: 40-50% of children and adolescents have anti-B19 specific IgG antibody as a sign of old B19 infection. Since adults are also infected, the rate of seropositivity in the population rises to around 60-70% in 20-30 years old, and 80% in 60-70 years old. According to the reports, 28% of women in reproductive ages in the USA and 81% in Sweden were immune to parvovirus B19.[8,9]

For susceptible pregnant women, the risk of infection is high during epidemics and is associated with the level of contact with children. Most infections during pregnancy are due to a woman's exposure to her own children.[10] Half of the cases with parvovirus infection tend to be asymptomatic.[3]

Chisaka *et al.* studied 478 women with suspected B19 infection. 21% of them were positive for anti-B19 specific IgM and IgG. Overall, incidence of adverse fetal effects (including hydrops fetalis and fetal death) related to intrauterine B19 infection was 7%.[3]

On the contrary, few studies are not in favor of the role of parvovirus B19 as a cause for fetal loss. According to the Johansson *et al.*, parvovirus viremia was associated with adjusted odds ratio of 3.76 for second trimester miscarriage,[11] but by considering the 95% confidence interval provided for the odds ratio (0.77-18.3), we can see that the association is not statistically significant. Another study by Odland *et al.* on the sera of two groups of normal pregnant women and recurrent abbortors from Russia, failed to find any correlation between parvovirus B19 infection and recurrent abortion.[12]

A large number of studies have buttressed the idea of potential correlation between parvovirus B19 infection during pregnancy and fetal loss. The study of Xu *et al.* demonstrated that 27.3% of spontaneous abortion tissues were positive for parvovirus B19-DNA, but this rate was only 4% in the control group (healthy women with artificial abortion).[13] Yaegashi *et al.* have reported the rate of fetal death in women infected with B19 during pregnancy to be 15%, which was far higher than the rate in the general population (1%).[14] Wang *et al.* have found parvovirus B19 DNA in 26% of subjects with spontaneous abortions as compared with 5% of subjects in the control group.[15] Tolfvenstam *et al.* have reported that 15% of cases of intrauterine fetal deaths were positive for parvovirus B19 in fetal or placental tissues or both.[8]

The only previous report from Iran failed to find any correlation between B19 seropositivity (IgG and IgM) and the unsuccessful pregnancy outcome.[16] In our study, we found the history of abortion to be higher among B19 seropositive cases compared

to the seronegative ones. Furthermore, the number of abortions was 4 times greater in the seropositive group compared to the seronegative group.

In this study, we had not tested for the antiparvovirus IgM antibody, hence drawing any conclusion on the presence of infection during pregnancy was not possible.

According to Crane in the presence of parvovirus B19 IgG and absence of IgM, the woman is immune and can be reassured that she will not develop infection and that the virus will not adversely affect her pregnancy.[17] However, in the study of Nyman *et al.* in Sweden 3% (36 cases) of first-trimester fetal losses, were B19 DNA positive, but in serologic study, they were seropositive for IgG and seronegative for anti-B19 IgM.[18] It seems that the reliable diagnosis of B19 virus infection should be based on parvovirus B19 DNA detection.[7]

In the current study, any of subjects (even who had a previous history of recurrent abortion) have not been screened for TORCH, or *Chlamydia trachomatis* infections, anatomical, chromosomal, endocrinal abnormalities, or for Rh incompatibility. The authors recommend that these factors be taken into consideration in future studies.

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