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SEROPREVALENCE OF PARVOVIRUS B19 ANTIBODIES AMONG YOUNG PREGNANT WOMEN OR PLANNING PREGNANCY, TESTED FOR TOXOPLASMOSIS

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ABSTRACT

INTRODUCTION AND OBJECTIVE. Acute parvovirus B19 (B19V) infection is a proven risk for pregnant women and fetus. The aim of this study was to determine the prevalence of B19V antibodies among pregnant women or planning pregnancy, who were referred for preventive toxoplasmosis screening.
MATERIAL AND METHODS. Between 2007-2010, 55 women in the age between 21 and 40 years were tested for both B19V IgG and IgM antibodies and sociodemographic information was collected.
RESULTS. Among the study group, the mean age was 30 years, 43.6% of women were positive only for B19V IgG antibodies, 9% were positive for both B19V IgG and IgM antibodies and 11% were positive only for B19V IgM antibodies. Women negative for B19 IgG antibodies (47.3%) were considered as a high-risk group of B19V viremia. The serological profile indicating infection with *Toxoplasma gondii* was considered as a risk factor for fetal distress. The *T. gondii* IgG antibodies were detected in 51% cases, in 32.7% antibodies were positive for both IgG and IgM, while in 16.3% cases both IgG and IgM were negative.
CONCLUSIONS. B19V infection and overlapping of other independent risk factors during pregnancy pose a significant hazard to fetus during development. Therefore, we recommend further broadening the epidemiological database of B19V infection prevalence among women. B19V infection should be taken into account during differential diagnosis as a cause of miscarriage.

Key words*: Parvovirus B19, seroprevalence, pregnancy, toxoplasmosis, Toxoplasma gondii*

INTRODUCTION

Parvovirus B19 (B19V) belongs to the genus *Erythrovirus* and the family *Parvoviridae*. It contains a single-stranded DNA and consists of about five thousand nucleotides. The small capsid is composed of two structural proteins, viral protein 1 (VP-1) viral protein 2 (VP-2) and one non-structural protein (NS-1), which may be responsible for transactivation of proinflammatory cytokines (1, 2). The infection is transmitted predominantly via the droplet route, however transmission via contaminated blood products also has been reported (3). The clinical manifestations of B19V infection vary greatly and depend on the age, hematologic and immunologic status. Most cases of B19V infection are asymptomatic. In healthy immunocompetent children the most common clinical presentation of infection is erythema infectiosum, (also called fifth disease), a mild febrile illness with rash (4). In adults it may cause clinically significant arthropathy (2, 5) Due to the tropism of B19V to erythroid progenitor cells, infection can cause transient aplastic crisis in individuals with a history of hematologic abnormalities, including increased destruction of red cells and decreased red cells production (2, 4).

B19V infection in a pregnant woman, followed by transplacental transmission to the fetus, may lead to fetal anaemia, miscarriage, nonimmune hydrops fetalis or even fetal death in utero (2). The risk of infection of pregnant women is about 3-3.8%, but varies across the community groups (primary school teachers - risk of 16%) (5, 6). The vertical transmission of B19V occurs in about one third of women infected during pregnancy. Consequently, in the first trimester the risk of fetal loss is 5-10%, while in the second trimester is about

11-12.5%. It is considered that up to 20% nonimmune hydrops fetalis may be caused by B19V (7). Moreover, it has been estimated that upwards of 3,000 pregnancies annually may be lost in the European Union and the United States due to B19V infection, based on an infection rate of 0.1% and a susceptible cohort of over 3 million pregnancies involving seronegative females (8). In Poland, the risk of some infections during pregnancy, such as B19V infection, and the accurate epidemiological situation seems not to be fairly well estimated. The aim of the study was to evaluate the seroprevalence of B19V infection among young pregnant or planning pregnancy women, who were referred for preventive toxoplasmosis screening.

MATERIAL AND METHODS

The study was conducted among women referred to the Department of Infectious Diseases and Neuroinfections of the Medical University of Białystok and the outpatient Epizootic Diseases Clinic of the University Clinical Hospital in Białystok in order to perform screening testing for toxoplasmosis in years 2007-2010. The study was performed among pregnant women or planning pregnancy. The study group consisted 55 women. The age was the inclusion criteria of the studied group. The following data were analyzed: the current state (pregnant/not-pregnant), number of pregnancies, number of births, pregnancy failure and the need for prevention of congenital toxoplasmosis. In the case of suspected acute toxoplasmosis of pregnant women or fetal infection, patients were directed immediately to the Department of Fetal-Maternal Medicine and Gynecology in Łódź.

In the study group, none of the women did not present any clinical signs of B19V infection, and did not have a history of contact with a sick person. Testing for toxoplasmosis was the reason for the admission to the Department or outpatient clinic. Suspected of being infected with *T. gondii* was treated as an independent risk factor and B19 infection as a separate risk factor studied in the same pregnant. Blood samples were taken from the basilic vein. After centrifugation, serum specimens were screened for *Toxoplasma gondii* IgG and IgM antibodies by the commercial AxSYM TOXO IgM and TOXO IgG (Abbott Laboratories Abbott Park, IL USA). The same serum specimens were investigated for the presence of B19V IgG and IgM antibodies. Because most cases of B19V infection are usually asymptomatic we screened serum specimens for both IgG and IgM antibodies. Blood samples with hemolyzed blood, yellowish or lipemic were disqualified from the trial. The assays used to determine the presence of B19V antibodies were B19V IgM ELISA (Recombinant) and B19V IgG ELISA (Recombinant), DRG (Germany).

RESULTS

The study included 55 women aged between 21 and 40 years, the mean age was 30 years. Among the study group 40 women (72.7%) were pregnant during the diagnostic process (the median gestational age was 14 weeks), 11 (20%) were planning to become pregnant and 5 (9.1%) were after spontaneous abortions in the past (one woman from the last group was pregnant at the time).

The serological profile indicating infection with *T. gondii* was considered as a risk factor for fetal distress. The IgG antibodies against *T. gondii* were detected in 28 cases (51%), in 18 cases (32.7%) antibodies were positive for both IgG and IgM, while in 9 cases (16.3%) both IgG and IgM were negative. In 15 cases (27.2%) the decision to start prophylaxis with spiramycin was made.

The same sera specimens were examined for the presence of B19V IgG and IgM antibodies. The obtained data shows that 24 of surveyed women (43.6%) were positive only for B19V IgG antibodies, indicating permanent maternal immunity from a prior infection and no risk to fetus. 5 women (9.1%) were positive for both B19V IgG and IgM antibodies and thereby were at risk group of possible or ongoing infection. 6 women (11%) were positive only for B19V IgM antibodies, indicating ongoing active infection. Whereas 20 women (36.4%) were negative for both B19V IgG and IgM antibodies. These results may be sign that they had no previous contact with B19V. In total, B19 IgG antibodies were detected only in 29 sera (52.6%). Women (47.3%) who had no IgG antibodies were considered as high-risk group of B19V viremia.

DISCUSSION

B19V is a common infectious pathogen in humans worldwide. In temperate climates, the infection may occur throughout the year, however the peak incidence occurs in the period from late winter to early summer. Every 4-5 years there are cyclic small epidemics reported, most frequently related with school communities and the people in close contact with children (2, 9). The percentage of people with positive B19V IgG antibodies increases with age, however most individuals become infected during their school years (4). Patients with positive B19V IgG antibodies are generally immune to reinfection. However, in a study by *Anderson et al*., healthy seropositive volunteers were inoculated with B19V and one became viremic, indicating that reinfection is possible (10).

Of particular interest is the infection of pregnant women who B19V can cause nonimmune hydrops

fetalis or even fetal death. Such effect arises from the B19V tropism to P antigen cellular receptor on erythroid progenitor cells. Our study is the first published report of B19V infection prevalence among our local population. The results of the study point out the fact that over 36% of pregnant women, or planning to become pregnant, never had contact with B19V, which makes them a high-risk group of infection during pregnancy and occurrence of fetal complications. *Siennicka et al.* assessed the seroprevalence of B19V antibodies in the Polish general population. Their results shows that the seroprevalence of B19V infection in the general population of women in the age corresponding to our study group is similar and is over 60% (11). Our results do not differ significantly from the data reported in other European countries. In women, seroprevalence of B19V antibodies range from 58.6% (Finland) to 73.3% (Germany) (12, 13). These results are also similar to those obtained in the Sudan, where 61.4% of the participating women were positive for B19V IgG antibodies (14). In a German study, it was reported that among women of childbearing age increased seroprevalence was in those from households with two or more children (81.6%) and in women having contact with children aged <6 years at work (88.9%) (18). In the Polish study of 1,800 pregnant women, the prevalence of IgG anti-B19V was 35%, and serological features of acute parvovirosis was found in 13.5% of women (15). In another Polish study, IgM antibodies were detected in over 10% of serum samples (true positive) (16)

Our study draw attention to another important issue which is the overlap of multiple independent risk factors for fetal infection. In our study, among women seronegative for B19V infection, four of them simultaneous required prophylaxis against toxoplasmosis

It is difficult to prevent the transmission of B19V because the infection is usually asymptomatic and during the epidemics period exposure is common. Simple hygienic measures, such as handwashing and avoiding shared food, drinks or utensils are likely to prevent, at least partially, spread of B19V infection (9).

CONCLUSIONS

A significant percentage of positive tests (43% IgG) among the examined pregnant or planning on being pregnant women points to the circulation of B19V in the population, which - conjoined with other factors - poses threat to the life of fetus. The presence of IgM (11%) in the examined group accounts for the need of study on that together with refining the diagnostics of B19V infection as recommended. The given percentage of women who lack antibodies (16.3%) attests to the fact that this group is prone to infection - a factor which in correlation with other independent pregnancy risk factors poses a considerable threat to the life of fetus. The database extension on the occurrence of B19V infections among the pregnant or planning on being pregnant women is advised.

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