

Research Article



Seroprevalence of Parvovirus B19 among Pregnant Women in Damascus, Syria

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ABSTRACT

Human parvovirus B19 has been implicated as a primary etiologic agent of erythema infectiosum (fifth disease) and a plastic crisis in patients with chronic haemolytic anemias. Infection with Human parvovirus B19 during pregnancy is known to be associated with adverse effects on fetuses such as hydrops fetalis and intrauterine fetal death. The objective of this study was to assess the seroprevalence of human parvovirus B19 among the pregnant women in Damascus, Syria and to compare this with that in other regions. A total number of 273 participants were included in the study, consisting of women of child-bearing age ranging from 21 to 42 years, and divided into age groups as follows: ≤ 21 years, 22-27, 28-32, 33-36, and ≥ 37 years. Specific IgM and IgG antibodies were measured using a commercial ELISA kit. The overall prevalence of IgG and IgM among women of child-bearing age was 61.2% and 4.8% respectively. It was observed that pregnant women in the age group between 37 and 42 had no detectable IgM. The presence of IgG and absence of IgM indicate immunity to primary infection. Our data showed that B19V infection is prevalent in Syria, and over one-third of the studied populations are at risk of primary infection with human parvovirus B19 which could adversely affect their pregnancy.

Keywords: Seroprevalence, human parvovirus B19, pregnancy, Syria, ELISA

INTRODUCTION

Human parvovirus B19 was discovered by Cossart while they were evaluating assays for hepatitis B virus in serum.¹ Human parvovirus B19, is a small, non-enveloped, single-stranded DNA virus that belongs to the family Parvoviridae. Among the parvoviruses, human parvovirus B19 is the first known pathogenic human parvovirus which is a cause of a common infection, that causes a number of clinical illnesses, most of which are benign.² Parvovirus B19 (B19) replication within erythroid progenitor cells leads to apoptosis, which ultimately results in inhibition of erythropoiesis.³ Erythroblastopenia can then occur as a consequence of parvovirus B19 replication, causing severe fetal anemia.⁴ Transmission of the virus occurs via respiratory route, but can be potentially transmitted by blood or transfusion of blood components.³ B19 can be transmitted transplacentally from an infected mother to the fetus, which leads to non-immune fetal hydrops (NIHF), spontaneous abortion, or intrauterine fetal death.⁵ The history of abortion is higher among B19 seropositive cases compared to the seronegative ones.⁶

Although the virus can be contracted in any trimester, the second trimester which coincides with the major development of the erythroid precursors seems to carry the highest risk of fetal loss.³ Between the third and sixth months of pregnancy, the fetal red blood cell mass increases thirty times, with a risk of developing anemia if the fetus is infected by parvovirus B19.⁷ By the third trimester, the fetus is able to mount a more effective immune response to the virus, which may account for the decrease in fetal loss at this stage of pregnancy.⁸

Seroprevalence of human parvovirus B19 increases with age.^{9,10} For example, 2–15% of children under age 5, 15–60% of those between the ages 5 and 19, and up to 60% of all adults are seropositive.¹¹ More than 90% of the elderly have a detectable antibody.¹²

The specific immunoglobulin M (IgM) antibody detection has been the core diagnostic test for acute parvovirus B19 infection, while the appearance of immunoglobulin G (IgG) antibodies is indicative of previous exposure to the virus. The prevalence of seropositivity to human parvovirus B19 infection in pregnant women, in Syria, has not been previously described and data regarding the role of parvovirus B19 in Syria are lacking.

The aim, therefore, of this study was to assess the seroprevalence of human parvovirus B19 among the pregnant women in Damascus, Syria as a preliminary evaluation of the role of this virus in fetal loss, and to compare the results to those of other countries.

MATERIALS AND METHODS

Samples

The study was conducted between March 2013 and February 2014 at the University Obstetric Hospital, Damascus, Syria.

After an informed consent was obtained from the participants, a total number of 273 pregnant women ranging in age from 21 to 42 years and at various trimesters of pregnancy were included in this study.

The women were divided into the following age groups: ≤ 21 years, 22-26, 27-31, 32-36, and ≥ 37 years. Blood samples of 5 to 10ml were collected from each patient.



Serum was separated, aliquoted into two Eppendorf tubes and stored at -20 °C until testing.

Methods

Seroprevalence of IgM and IgG of different age groups was done using a commercial indirect ELISA (Novatec; Immunodiagnostic GmbH, Germany, Distributor: DiaSorin, Italy) according to the manufacturer's instructions. Briefly, sera were diluted 1+100 with IgG Sample Diluent and incubated for 60 min at 37 °C on a specific antigen precoated 96 well plate. After washing, horseradish peroxidase conjugated anti-human IgG was used as second antibody (incubation 30 min at room temperature). Tetramethylbenzidine (TMB) was added after an additional washing and incubated for exactly 15 min at room temperature in the dark. The reaction was stopped with 0.2 M sulphuric acid solution after 15 min and the absorbance of the specimen were measured at 450/620 nm within 30 min after addition of the Stop Solution. Samples are considered **positive** if the absorbance value is higher than 10% over the cut-off, while that with an absorbance value of 10% above or below the cut-off should be considered as **grey zone**. Samples with absorbance value lower than 10% below the cut-off are considered **negative**.

Statistical Analyses

To analyze the data, the statistical package for social sciences (SPSS) was used. The Chi-square test was applied to assess the association between the categorical variants. A p-value of < 0.05 was used as the cut-off level for significance.

RESULTS

Among the 273 pregnant women tested, 167 (61.2%) were positive for IgG parvovirus B19 implying immunity for parvovirus, whereas only 13 (4.8%) demonstrated positivity for IgM (Table 1). All the IgM-positive cases were also positive for IgG antibodies. No detectable IgM was observed in the child-bearing women aged 37 years and older, while the highest IgM prevalence of 9.4% was noted among pregnant women aged between 22-26 years. Seroprevalence of IgG antibodies was observed to increase with increased age, but this was not statistically significant ($p=0.673$), Figure 1.

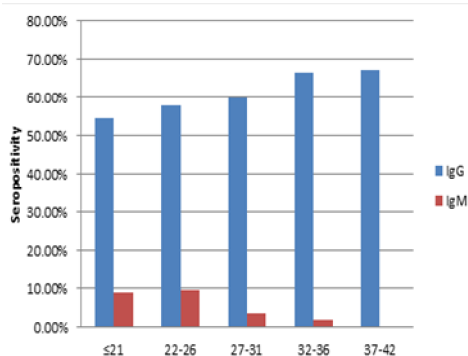


Figure 1: IgM and IgG seropositivity to parvovirus B19 in different age groups

Table 1: Prevalence of parvovirus B19 IgM and IgG antibodies in different age groups.

| Age (years) | Number analyzed | IgM presence n/(%) | IgG presence n/(%) |
|-------------|-----------------|--------------------|--------------------|
| ≤21 | 33 | 3/(9%) | 18/(54.5%) |
| 22-26 | 64 | 6/(9.4%) | 37/(57.8%) |
| 27-31 | 82 | 3/(3.7%) | 49/(59.8%) |
| 32-36 | 51 | 1/(2%) | 34/(66.7%) |
| 37-42 | 43 | 0/(0%) | 29/(67.4%) |
| Total | 273 | 13/(4.8%) | 167/(61.2%) |

DISCUSSION

The seroprevalence of IgM and IgG antibodies to human parvovirus B19 in pregnant women in Syria has not been investigated previously. Other countries in the Middle East and the Arabian Gulf have reported a seroprevalence of IgG of 46.6%-53.3%.^{4,13,14} In other countries such as Brazil, England, and Japan, the prevalence was found to be 71.7%, 53% and 33% respectively.^{12,15,16} Almost half of women of child-bearing age are susceptible to parvovirus B19 infection.

In our study, 167/273 (61.2 %) of pregnant women were positive for human parvovirus B19 IgG antibodies which is very similar to other studies. In a recent study in Sudan, Adam O revealed that the seroprevalence of parvovirus B19 IgG was found to be 61.4%.¹⁷ The level of B19 IgG antibodies in our study population was lower than the 81% reported in Sweden between 1990-1991¹⁸ and higher than the 20% and 27.5% reported in Nigeria.^{19,20}

Our data agrees with findings in other parts of the world. For example, Ziyaeyan reported a prevalence of IgG and IgM of (61%) and (2.2%) respectively, among the 184 pregnant women they studied¹⁰. Our study showed a relatively high rate (61.2%) of immunity against a lower rate (4.8%) of active transmission among pregnant women. This is consistent with the findings of Elnetro who reported a prevalence of IgG and IgM of (61%) and (5%) respectively, in their study population.²¹ Moreover, in a study conducted on Kuwaiti pregnant women, the seroprevalence of IgG and IgM to human parvovirus B19 was shown to be 53.3% and 2.2% respectively.¹⁴ In a similar study in Saudi Arabia, Ghazi showed that the seroprevalence of IgG and IgM to human parvovirus b19 in pregnant women in different age groups was 46.6% and 2.25% respectively, signifying that our results are well in agreement with the regional reports.¹³

The highest prevalence rate of B19 IgG antibodies in our study was found to be (67.4%) and this was observed in pregnant women aged between 37-42 years. This is consistent with the fact that seroprevalence of PVB19 IgG antibodies is dependent on age and agrees with previous reports.^{13,14}

Among the 273 pregnant women, 13 (4.8%) were positive for PVB19 IgM antibodies. This is similar to findings in Iran, Nigeria and Libya, where the prevalence of PVB19



IgM antibodies among pregnant women was found to be 2.2 %, 4% and 5% respectively.^{10,18,21}

Women aged between 22-26 years in our study had the highest prevalence rate (9.4%) of IgM antibodies. While the lowest rate (0%) was noted in women who are older than 37 years. A possible explanation for this is that younger women had never had previous infection as compared with older women.

CONCLUSION

This study has identified for the first time the seroprevalence of human parvovirus B19 in the population of pregnant women in Damascus, Syria and showed that B19 infection is prevalent in Syria as over one-third of the studied population is susceptible to primary infection with B19 during childbearing age.

We recommend further studies in Syrian women, particularly in those with complications and adverse outcomes of pregnancy.

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