The Seroprevalence of Parvovirus B19 among Pregnant Women with Spontaneous Abortion in Thi-Qar province, Iraq

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Abstract

Background: Parvovirus B19 (B19 V) is a pathogenic for humans and the cause of erythema infectiosum, a common rash of childhood. B19 infection also causes severe disease such as chronic anemia in immunocompromised patients; aplastic crisis in the fetus can lead to cardiac failure, nonimmune hydrops, and fetal death in pregnant women. Objective: To determine the seroprevalence of immunoglobulin (IgM, IgG) to Parvovirus B19 in pregnant women with spontaneous abortion. Materials and Methods: Cross sectional study was carried out in 100 pregnant women who referred due to a spontaneous abortion that attended at Bunt AL- Huda hospital for maternity and children in Thi-Qar province, Iraq. Then, the blood samples were tested to assay of anti-human B19 specific IgM, and IgG using commercial enzyme-linked immunosorbent assays (DRG-Elisa kit, Germany). Furthermore, a questionnaire filled for all participants during samples collection. Results: Among study group the mean age was 27.35 years, with an age range 17-40 years. Seropositivity rate was 34% (34 cases) for an individual occurrence of human parvovirus B19 IgM alone and 38% (38 cases) for a similar individual rate of human parvovirus B19 IgG, Meanwhile, 12 cases (12%) had both types of antibodies. There was no significant difference between the presence of antibody and age of pregnant women, gestational age, number of previous abortion, presence of children below the age of six. Conclusion: The results of this study showed (84%) of studied participants had a high susceptibility to parvovirus B19 in a way similar to that found in most countries. And also there might be a number of spontaneous abortions in which parvovirus infection caused fetal death. However, more studies are needed to prove the absolute role of parvovirus B19 in these abortions.

Keywords: Pregnant women, Spontaneous abortion, Human parvovirus B19, ELISA.

Introduction

Human parvovirus (B19) infection occurs worldwide, was first discovered in 1975 by Cossart and colleagues in England while screening a healthy blood donor serum [1].

The B19 virus belonging to the Parvoviridae family and genus Erythrovirus, a small, nonenveloped, single-stranded DNA virus. [2–3].

B19V infects humans of all ages and causes several syndromes. Infection causes Erythema infectiosum (Fifth Disease) in children, polyarthropathy syndrome in adults, and transient aplastics crisis in patients with underlying chronic hemolytic anemia [4].

B19 is normally spread via the respiratory route, and blood transmission is also a common means, transplantation, or vertically from mother to fetus at a transmission rate of 25–50%. [5].

When infection occurs during pregnancy, it may cause severe anemia and nonimmune hydrops fetal is (NIHF), which could lead to spontaneous abortion, intrauterine fetal death [5-6].

Thirty percent to 50% of pregnant women are susceptible to B19, only a small percentage of them will be infected with this virus. [7] The risk of fetal death attributable to acute B19V infection during pregnancy is estimated to be <10%, ranging from 3- 38% in different studies. [8]

Parvovirus infection of mothers is diagnosed using serologic or an immune assay enzyme B19 IgM and B19 IgG, If the mother has B19-specific antibodies (IgG) against the virus,
there will be no possibility of virus transition to the fetus. [9-10] there are several risk factors about its infection in pregnant women. For example, the risks of infection in pregnant women with one child are 3 times more than nulliparous women. Although by increasing gestational age, the incidence of infection and fetal death decreases [10].

Regarding to complications related to B19 virus infection during pregnancy and lack of study about its infection prevalence in Thi Qar province, this study was conducted with the aim of determination of the prevalence of parvovirus specific antibody IgM and IgG among pregnant women who had a spontaneous abortion.

Materials and Methods

In a cross-sectional study between January 2017 and October 2017, this study was carried out at Bunt AL- Huda hospital for maternity and children in Thi-Qar province, Iraq.

The numbers of samples were calculated 100 pregnant women with spontaneous abortion. An informed consent was obtained from each subject including age, gestational age, previous history of abortion, number of pregnancy and children under six years old were recorded.

Before the blood sample was collected, the procedure was thoroughly explained to every subject to ensure that they understood exactly what was going to happen. It was also pointed out to the subjects that they could refuse to participate in the study without prejudice.

A sample of 3 milliliters of venous blood was collected from each of the pregnant women in a clean, plain plastic test tube and left to clot at room temperature, then rotated at 3000 rpm using ordinary centrifuge for five minutes, finally the sera were collected, labeled and stored at -20 °C for subsequent analysis. Enzyme linked immunosorbent assay (ELISA) used for the detection of human parvovirus B19 IgM and IgG (ELISA; DRG/ Germany).

The technique was performed according to manufacturer's instructions. Data then coded and were statistically analyzed using SPSS v16 software. The Chi-square and T-test and descriptive methods were used for data analysis. The significant levels of 0.05 were used for all statistical analysis.

Results

A total of 100 pregnant women with spontaneous abortion participated in the study. The minimum and maximum ages of pregnant women were 17 and 43 years, respectively, with a mean age of 27.35 years, and standard deviation of 5.39 years. Participants in the study were divided into 3 age groups. Majority of the samples was reported at age 17-27 years constituted 65 (65 %). There was significant differences (P<0.05) were noticed among the groups. As shows in Table (1).

In addition, gestational age of women was determined, pregnant women with an abortion were divided into two categories, < 3 months and ≥ 3 months. The results of current study demonstrated that 75% of participants were with gestational age below 3 months and 25% of participants were with gestational age of 3 months or more.

There were highly significant differences at P<0.05 noticed among them. (Table1). As shows in Table (1), twenty (20%) participants with a child under six years old, and 80 (80%) without a child younger than 6 years old which was statistically significant (P<0.05).

Regarding to the number of previous abortion, the results have indicated that the highest percentage of the study samples had second time abortion which accounted for 49(49 %) of cases, followed by first time abortion which accounted for 38(38 %) while third time abortion was 13(13 %). Statistically significant difference at (P<0.05) was found.

Table 1: Characteristic pregnant women who had an abortion, in terms of patients' information

<table>
<thead>
<tr>
<th>Age group</th>
<th>(N =100)</th>
<th>P.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-27</td>
<td>65</td>
<td>65%</td>
</tr>
<tr>
<td>28-38</td>
<td>33</td>
<td>33%</td>
</tr>
<tr>
<td>39-49</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100%</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>27.35 ± 5.39</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gestational age</th>
<th>(N =100)</th>
<th>P.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3 months</td>
<td>75</td>
<td>75%</td>
</tr>
</tbody>
</table>
The overall, 100 pregnant women tested for the presence of B19VspecificIgM antibodies, 34 (34%) were found to be positive, the results also showed that 38 (38%) of the pregnant women tested had parvovirus B19 IgG antibody. indicating prior exposure to B19V. The results revealed that presence of anti-human parvovirus B19 IgM and IgG in12% (12 cases) (Table 2).

The prevalence of parvovirus B19 antibodies in relation to age groups is presented in Table (3). The seropositivity was variable in different age groups, but generally the highest prevalence was observed in age group more than 17-27 years 26 (40%) B19 IgM, 26 (40%) B19 IgG, 10 (15.38%) B19 IgM and IgG. The association between age and seropositivity to B19 was statistically not significant (P>0.05).

The seropositivity of parvovirus B19-IgM and IgG antibody in relation to spontaneous abortion according to ELISA results is summarized in Table (4). The percentage of seropositivity was observed in the first trimester 26 (34.6 %) compared to the percentage of women with B19-IgM in second trimester 8(32%), also 30(40%) B19 IgG positive was observed in the first trimester while 8(32%) B19 IgG in the second trimester. The association between fetal losses at the first and second trimester of pregnancy and Parvovirus specific antibody was not significant (P<0.05).

The relation between Parvovirus B19 serological results and participants with and without a child under six years old is presented in Table (5). which showed that

<table>
<thead>
<tr>
<th>Gestational age</th>
<th>N</th>
<th>B19 IgM Positive</th>
<th>B19 IgM Negative</th>
<th>B19 IgG Positive</th>
<th>B19 IgG Negative</th>
<th>B19 IgM , IgG Positive</th>
<th>B19 IgM , IgG Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3 months</td>
<td>75</td>
<td>26 (34.6 %)</td>
<td>49(65.4%)</td>
<td>30 (40%)</td>
<td>45(60%)</td>
<td>8(10.6%)</td>
<td>67(89.4%)</td>
</tr>
<tr>
<td>≥ 3 months</td>
<td>25</td>
<td>8(32%)</td>
<td>17(68%)</td>
<td>8(32%)</td>
<td>17(68%)</td>
<td>4(16%)</td>
<td>21(84%)</td>
</tr>
<tr>
<td>P.Value</td>
<td>0.807</td>
<td>0.475</td>
<td>0.477</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P-value< 0.05 consider significant
The parvovirus 19 highest seropositivity19 (42.22%) B19IgM for the fetal losses occurred in the second abortion. While 19(50%) B19 IgG was noticed among those fetal losses in the first abortion. The relationship between number of the abortion and prevalence of Parvovirus B19 was insignificant .Table (6).

**Table 5:** Distribution of serology parvovirus B19 prevalence among pregnant women according to Having a child under 6 years

<table>
<thead>
<tr>
<th>Having a child under 6 years</th>
<th>N</th>
<th>B19 IgM</th>
<th></th>
<th>B19 IgG</th>
<th></th>
<th>B19 IgM , IgG</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Yes</td>
<td>20</td>
<td>4 (20%)</td>
<td>16(80%)</td>
<td>4 (20%)</td>
<td>16(80%)</td>
<td>1 (5%)</td>
<td>19(95%)</td>
</tr>
<tr>
<td>No</td>
<td>80</td>
<td>30(37.5%)</td>
<td>50(62.5%)</td>
<td>34(42.5%)</td>
<td>46(57.3%)</td>
<td>11(13.75%)</td>
<td>69(86.25%)</td>
</tr>
</tbody>
</table>

*P-value< 0.05 consider significant

**Table 6:** Distribution of B 19 antibodies in relation to number of the abortion

<table>
<thead>
<tr>
<th>Number of abortion</th>
<th>N</th>
<th>B19 IgM</th>
<th></th>
<th>B19 IgG</th>
<th></th>
<th>B19 IgM , IgG</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>1st</td>
<td>38</td>
<td>12 (31.5 %)</td>
<td>26(68.5%)</td>
<td>19 (50%)</td>
<td>19(50%)</td>
<td>5(13.15%)</td>
<td>33(86.85%)</td>
</tr>
<tr>
<td>2nd</td>
<td>49</td>
<td>19(42.22%)</td>
<td>30(61.23%)</td>
<td>15(30.61%)</td>
<td>34(69.39%)</td>
<td>5(10.2%)</td>
<td>44(89.8%)</td>
</tr>
<tr>
<td>3rd</td>
<td>13</td>
<td>3(23%)</td>
<td>10 (77%)</td>
<td>4(30.76%)</td>
<td>9(69.24%)</td>
<td>2(15.38%)</td>
<td>11(84.62%)</td>
</tr>
</tbody>
</table>

*P-value< 0.05 consider significant

**Discussion**

B19 is not only the etiologic agent of erythema infectiosum in children but also causes several clinical manifestations in immunocompromised patients and the patients with a high turnover rate of red blood cells, and more importantly, hydrops fetalis in pregnant woman [5,11]. Acute infection of Parvovirus B19 in pregnancy was recorded 1-2% that increases to more than 10% during an epidemic outbreak of the virus that happens every 3-6 years [12]. Currently, because of the epidemic nature of the circulation of B19V and its potential to cause serious disease, interest in B19V seroprevalence has risen throughout the world.

Some studies have looked for the B19V seroprevalence in Iraq. In a study performed in Baquba-Diyala province,Iraq, that found the frequency of human parvovirus B19 was 31.11% among pregnant women with previous abortions,[13] while in another study in Basrah city of Iraq, showed that the seropositivity of parvovirus B19 among pregnant women generally high 91/49 (53.8%) [14] In another study, B19specific IgM antibodies were detected in (51.1%) of Iraqi blood donors of different age groups.[15] Results of this study showed that the frequency of human parvovirus B19 was 84% among pregnant women with previous abortions. Similar results were reported by Zaki’s study, 84% of pregnant women with recurrent spontaneous abortions were positive for parvovirus [16]. The result indicates high prevalence of this virus in Thi_Qar region. These findings were similar to those of another study carried out in Norway where the high prevalence of B19V in 2000 pregnant women tested was 59.7%.[17]. However, in Iran, the B19V seroprevalence in 86 pregnant women tested was slightly higher (75.6%) [18] in Saudi Arabia, the prevalence of B19V 182/364 (50%) of Saudi pregnant women of different age groups [19].

The present study showed that 34% of participants had Parvovirus B19 IgM specific antibody at the time of abortion which shows primary acute infection during pregnancy. It seems that many pregnant women are not immune to this virus during pregnancy The high titers of parvovirus B19 antibody found in this study is consistent with a study carried out in Basrah 2007 that showed 65.2–72.2% of general population were positive to parvovirus B19-IgG.[20] Another study carried out in Brazil of an outbreak of exanthematous disease was reported that 58.3% of cases were positive to B19-IgM[21] Parvovirus B19 IgM usually appears within 2 to 3 days of acute infection and may persist
up to 6 months. Parvovirus B19 IgG appears a few days after IgM appears and usually remains present for life [22]. The results also showed that 38% of the pregnant women tested had parvovirus B19 IgG antibody. This finding is slightly lower than that of a study in , Elrifro (2009) who found high prevalence of human parvovirus B19 among pregnant, in Libya was 69% [23] and are still lower than study done by Ghazi (2007) who showed the prevalence of parvovirus B19 IgG antibody among pregnant women was 46.6%.[24] Some researcher reported lower prevalence. For example, a study in Iyanda et al., (2013) who found high prevalence of human parvovirus B19 among pregnant, (45 out of 231)20% were positive for parvovirus B19 IgG antibodies and a study done by Emiasegen et al., (2011) who showed the prevalence of parvovirus B19 IgG antibody among pregnant women was 27.5% [25,26].

The differences between the results of the previously mentioned studies and even with the results of present study could be related to many factors, like sampling methods, diagnostic methods, sample size, studied population, individual’s immune status, demographic and geographical variations season and, etc. Knowledge on the prevalence rate of an infectious agent in relation to age is important in order to identify the target age of population for an effective control measures.

The current study showed that no significant correlation were between anti-human parvovirus B19 and patient’s age. In this study the seropositivity to B19 is highest among age group 17-27 years this result is nearly compatible with the result of Ziyaeyan (2005) and Sohrabi (2007) studies,[27,28] Recent studies in Europe have shown that a wide range of women in reproductive age is sensitive to the infection with Parvovirus B19 (from 26% in Belgium to 44% in Finland)[29] Our results indicate age cannot be considered as risk factors for infection. The risk of fetal death is a function of gestational age at infection. Approximately 3% of first trimester spontaneous abortions may be due to B19 infection, though this may differ between epidemic and non-epidemic periods. According to gestational age, maternal infection in the first trimester, 13-20 weeks and after 20 weeks is associated with a risk of fetal death of 19%, 15% and 6%, respectively [30,31].

According to gestation age, in current study most infections occurred before 3 months. The reason was uncertain but may be related to multisystem organ damage. The fetus is at particularly high risk in the second trimester because of the rapidly increasing RBC mass due to growth and the relatively short life span of the fetal RBCs [32] In current study, there is no significant correlation between the acute Parvovirus B19 infection in aborted pregnant women with history of abortions, and having children under six years old; so these cannot be considered as risk factors for infection. These results also could be explained due to limited sample size.

Conclusion

The results of this study showed (84%) of studied participants had a high susceptibility to parvovirus B19 in a way similar to that found in most countries. However, more studies on the prevalence of B19V in Iraqi women in different cities of Iraq, particularly in those with complications and adverse outcomes of pregnancy are recommended. Finally, health education and screening is mainly by serology and PCR, immediate diagnosis in hydropsic fetuses can decrease the risk of fetal death.

Acknowledgments

The author would like to acknowledge the Bunt AL- Huda hospital for maternity and children in Thi-Qar province and AL Nasiriyah Technical Institute / Southern Technical University, for their cooperation in accomplishing this study.

References


15. Ibraheem W Nazar, Human parvovirus B19 IgM antibodies among blood donor in Basrah. THI-QAR Medical Journal 11 (1), 76-83


