

Detection of Human Parvovirus B19 antibodies in Pregnant Women with Spontaneous Abortion

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Abstract:

Background: Viral infection in pregnancy is known to cause many problems such as fetal malformation; growth restriction and even fetal death; the relationship between viral infection and abortions is not well understood. The infection during pregnancy can affect the fetus due to lack of mother's immunity.

Objective: To assess the frequency of human parvovirus B19-specific antibody type IgM and IgG among pregnant women with spontaneous abortion.

Patients and Methods: A semi-quantitative enzyme linked immunosorbent assay technique was applied for detection of anti-human parvovirus B19 IgM (Ridascreen-K6031-Germany) and IgG (Ridascreen -K6021-Germany) in sera of 90 pregnant women who have previously experienced abortion were collected from Al-Batool teaching hospital for maternity and children in Baquba-Diyala province, Iraq, during the period from October 2014 till May 2015. The age was ranged from 18-40 years. Statistical analysis was performed by using statistical package of social sciences, version-16, and P-value of < 0.05 as significant difference.

Results: Among study group the mean age was 26.57 years, with an age range 18-40 years. Seropositivity rate was 11.11% (10 cases) for an individual occurrence of human parvovirus B19 IgM alone and 13.33% (12 cases) for a similar individual rate of human parvovirus B19 IgG, while 6 cases (6.66%) had both types of antibodies. Multiple variables regarding occurrence of anti-human parvovirus B 19 specific IgM and IgG antibody simultaneously, was evaluated, and none the variables had significant difference.

Conclusion: The fact that 31.11% of studied participants had specific Parvovirus B19 antibody revealed a high occurrence of primary acute parvovirus infection and non-immune against parvovirus B19. Considering the potential role of this virus in abortion and fetal death, it emphasizes the importance of Parvovirus infection in pregnant women also this finding is comparable with that in the other countries.

Key word: Pregnant women, Abortion, Human parvovirus B19, ELISA.

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Introduction:

Parvovirus B19 is a single-stranded DNA virus that is responsible for erythema infectiosum, a common childhood illness with rash in preschool or school-aged children [1]. Human parvovirus B19 (B19V) was first described in 1975 [2]. Also this virus causes subclinical infection, but it can prove fatal to the fetus during pregnancy and cause severe anemia in an adult with hemolytic diseases [3].

Human parvovirus B19 is transmitted not only via respiratory secretions but also vertically from mother to fetus at a transmission rate of 25–50% [4]. Antenatal B19V infection can lead to hydrops fetalis, miscarriage (fetal loss before week 22 of gestation) and intrauterine fetal death (at or after week 22) [5].

Several factors have been associated with an increased risk of acute parvovirus B19 infection in pregnant women. For example, women who have only one child have a threefold greater risk of infection compared with nulliparous women. Also, the risk increases about seven and a half times in women

with three or more children. Working in nursery schools, after-school clubs, or day-care centres also appears to increase the risk [6]. Parvovirus B19 cannot usually be cultured in regular culture media. It can be identified histologically by characteristic intranuclear inclusions or by the presence of viral particles by electron microscopy [7].

Simple and accurate diagnosis of vertical transmission of human parvovirus B19 infection remains an important issue in pregnancy. There are few reports on quantitative analysis of B19V in amniotic fluids. Quantitative estimation of B19V DNA in amniotic fluids was compared with those in maternal or fetal serum obtained at an early stage of pregnancy and revealed possible mother to fetus transmission [5].

Our objectives were to assess the prevalence of human parvovirus B19 specific antibody IgM and IgG among pregnant women with spontaneous abortion and study the relation with other parameters such as age, gestational age and number of previous abortions.

Patients and Methods:

Study design: Cross-sectional study was carried out at Al-

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Batool teaching hospital for maternity and children in Baquba -Diyala province, Iraq, during the period from October 2014 till May 2015. Ninety pregnant women with spontaneous abortion, the range age between 18-40 years. A written informed consent was obtained from each patient which included the following information: age, gestational age and number of previous abortions.

Ethical approval: The proposal was reviewed and approved by College of Medicine; University of Diyala, permission to conduct this study was obtained from Al-Batool teaching hospital for maternity and children administrator in Baquba city, Diyala. Iraq. Participants were also informed that they have full right to discontinue or refuse to participate in this study.

Blood sampling and laboratory analysis: From each participating women a blood sample were collected 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 (Ridascreen-K6031-Germany) and human parvovirus B19 IgG (Ridascreen -K6021- Germany). The technique was performed according to manufacturer’s instructions.

Statistical analysis: Data was analyzed using statistical

package of social sciences (SPSS) for version 16. Differences in proportions were assessed by Chi-square test. P-values < 0.05 were considered statistically significant.

Results

As shows in table 1, among patients minimum age was 18 years and maximum was 40 years. Mean age of the pregnant women with spontaneous abortion was 26.57 years; majority of the samples was reported at age 18-28 years constituted 56 (62.22%). There was significant differences (P<0.05) were noticed among the groups.

According to gestational age and as show in table (2), pregnant women with an abortion were divided into two categories, <12 weeks and ≥ 12 weeks. The results of current study demonstrated that 73.33% of participants were with gestational age below 12 weeks and 26.66% of participants were with gestational age of 12 weeks or more. There were highly significant differences at P<0.05 noticed among them.

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 42(46.66%) of cases, followed by first time abortion which accounted for 25(27.77%). Statistically significant difference at (P<0.05) was found, as shows in table (3).

Table (1): Characteristic of study group

Parameters	Number	Percentage	Comparison of Significance	
			Chi-Square	P-value
Age stratum				
18-28 years	56	62.22%	48.800	0.000
29-38 years	32	35.55%		
39-48 years	2	2.12%		
Total	90	99.99%		
Duration of pregnancy				
< 12 weeks	66	73.33%	19.600	0.000
≥ 12 weeks	24	26.66%		
Total	90	99.99%		
Number of abortion				
1 st	25	27.77%	7.267	0.026
2 nd	42	46.66%		
3 rd	23	25.55%		
Total	90	99.99%		

Table (2): Distribution of pregnant women with spontaneous abortion according to ELISA results

ELISA Results	Positive No. %	Negative No. %	Total No. %
B19 IgM	10(11.11%)	80(88.88%)	90(99.99%)
B19 IgG	12(13.33%)	78(86.66%)	90(99.99%)
B19 IgM, B19 IgG	6(6.66%)	84(93.33%)	90(99.99%)

Multiple variables regarding incidence of anti-human parvovirus B 19 specific IgM, IgG antibody simultaneously, was evaluated, and none of the variables have significant difference as show in table (3), (4) and (5).

Table (3): Detection of anti-human parvovirus B19 IgM antibody in relation to different parameters

Variables	ELISA results Positive IgM	Negative	Comparison of Significance Chi ² -value P-value	
Age				
18-28	4(40%)	52(65%)	3.033 Non- Sig .	0.219
29-38	6(60%)	26(32.5%)		
39-40	0	2(2.5%)		
Total	10(100%)	80(100%)		
Duration of pregnancy				
<12 weeks	5(50%)	61(76.25%)	3.132 Non- Sig.	0.123
≥ 12 weeks	5(50%)	19(23.75%)		
Total	10(100%)	80(100%)		
Number of abortion				
First time	5(50%)	20(25%)	3.172 Non- Sig.	0.205
Second time	4(40%)	38(47.5%)		
Third time	1(10%)	22 (27.5%)		
Total	10(100%)			

Table (4): Detection of anti-human parvovirus B19 IgG antibody in relation to different parameters

Variables	ELISA results Positive IgG	Negative	Comparison of Significance Chi ² -value P-value	
Age				
18-28	9(75%)	47(60.25%)	1.105 Non- Sig .	0.576
29-38	3(25%)	29(37.17%)		
39-40	0	2(2.50%)		
Total	12(100%)	78(100%)		
Duration of pregnancy				
<12 weeks	8(66.66%)	58(74.35%)	0.315 Non- Sig.	0.726
≥ 12 weeks	4(33.33%)	20(25.64%)		
Total	12(99.99%)	78(99.99%)		
Number of abortion				
First time	3(25%)	22(28.20%)	0.073 Non- Sig.	0.964
Second time	6(50%)	36(46.15%)		
Third time	3(25%)	20 (25.64%)		
Total	12(100%)			

Table (5): Co-detection of anti-human parvovirus B19 IgM and IgG antibody in relation to different parameters

Variables	ELISA results Positive	Negative	Comparison of Significance Chi ² -value P-value	
Age				
18-28	3(50%)	53(63.09%)	0.674 Non- Sig .	0.714
29-38	3(50%)	29(34.52%)		
39-40	0	2(2.38%)		
Total	6(100%)	84(99.99%)		
Duration of pregnancy				
< 12 weeks	4(66.66%)	62(73.80%)	0.146 Non- Sig.	0.656
≥ 12 weeks	2(33.33%)	22(26.19%)		
Total	6(99.99%)	84(99.99%)		
Number of abortion				
First time	2(33.33%)	23(27.38%)	0.285 Non- Sig.	0.867
Second time	3(50%)	39(46.42%)		
Third time	1(16.66%)	22 (26.19%)		
Total	6(100%)			

Discussion

Parvovirus B19 deserves special attention since the harmful effects on the pregnant woman and fetus as it can then cause fetal anemia, non-immune fetal hydrops and fetal death [8]. We found the frequency of human parvovirus B19 was 31.11% among pregnant women with previous abortions. This percentage was similar to the prevalence of human parvovirus B19 in pregnant women described in some Arabic countries

such as Egypt, Libya and Tunisia [9] [10] [11]. The current study demonstrated that 11.11% of participants had parvovirus B19 IgM specific antibody at the time of abortion which indicating for primary acute infection. This result is comparable to those of Jensen et al., (2000) and Rahbar et al., (2015) who reported seropositivity in 12.9% and 18.1% respectively. Our result was higher than that reported by Iyanda et al., (2013) who found 10 cases (4%) were positive for parvovirus B19

IgM antibodies also was comparable with study done by Zhou et al., (2015) who reported that low rate (9.31%) for B19 IgM. However, a higher rate (48%) had been reported in other study done by El-Sayed et al., (2007). 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 [16]. Acute infection of parvovirus B19 in non-immune pregnant women was recorded 30 to 50 [17]. The results also showed that 13.33% of the pregnant women tested had parvovirus B19 IgG antibody. This finding is slightly lower than that of 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 are still lower than study done by Emiasegen et al., (2011) who showed the prevalence of parvovirus B19 IgG antibody among pregnant women was 27.5% [18]. As well as lower than the results of study by Hasan et al., (2013) who found that anti-parvovirus B19 was 24.7% among health pregnant women in Diyala province. The presence of anti-human parvovirus B19 IgM and IgG in 6 cases indicates that women had recent infection. 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 the methodology in our study I'm used immunological method while other study may be use molecular technique, sample size, studied population different from one area to another, the duration of incubation if samples collect in acute infection the result will different from chronic infection, individual's immune status, demographic and geographical variations season and etc. Regarding age, this study showed that no significant correlation were between anti-human parvovirus B19 and patient's age, this result is nearly compatible with the result of Rahbar et al., 2015. In this study most cases occur within age group 18-28 years and were in agreement with the study of Hasan et al., (2013). Other study had affirmed that the seroprevalence of human parvovirus B19 infection increase by age [18]. Our results indicate age cannot be considered as risk factors for infection. The risk of adverse fetal outcome is increased if maternal infection occurs during the first two trimesters of pregnancy but may also happen during the third trimester. It is a significant cause of fetal loss throughout pregnancy, but has a higher impact in the second half of pregnancy when spontaneous fetal loss from other causes is relatively rare [20]. According to gestation age, in current study most infections occurred before 12 weeks. The spontaneous loss rate of fetuses affected with parvovirus B19 before 20 weeks' gestation is 14.8% and after 20 weeks' gestation is 2.3% [21, 22, 23]. The reason was uncertain but may be related to multisystem organ damage [7]. 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 [7]. In the first

half of pregnancy, fetal infection with parvovirus B19 results in a substantial risk of miscarriage, fetal hydrops, and death. With known acute maternal infection, the fetus can be followed by sonographic examinations every week for 12 weeks for development of hydrops or Doppler waveform evidence of anemia [24, 25, 26]. While not record any positivity in third trimester this may be related with fact in the third trimester, the fetus is able to amount a more effective immune response to virus [27]. No significant difference was noticed between number of abortion and prevalence of human parvovirus B19, these results also could be explained due to limited sample size. In conclusion, the fact that 31.11% percent of studied participants had specific Parvovirus B19 antibody revealed a high occurrence of primary acute parvovirus infection and non-immune against parvovirus B19, it emphasizes the importance of Parvovirus infection in pregnant women also this finding is comparable with that in the other countries. Since no vaccine exists against this virus, further study is required to answer this question: Is it necessary to check pregnant women's immunity against B19 virus?

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