Original Article

Seroprevalence of erythrovirus B19 in Saudi pregnant women

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ABSTRACT

Background: Erythrovirus B19 infection is associated with clinical symptoms that range from mild to severe. The common clinical presentation of B19 virus (B19V) infection is erythema infectiosum, arthropathy, aplastic crisis, and fetal infection. Infection in seronegative pregnant women can lead to fetal hydrops. **Objectives:** To determine the seroprevalence of immunoglobulin G (IgG) to erythrovirus B19 in Saudi pregnant women in the cities of Makkah and Jeddah in Saudi Arabia. **Materials and Methods:** A total of 364 blood (serum) samples were tested for erythrovirus B19-specific-IgG antibody in Saudi pregnant women in the cities of Makkah and Jeddah in Saudi Arabia. **Results:** Erythrovirus B19-specific-IgG antibodies were detected in 182/364 (50%) of Saudi pregnant women of different age groups. **Conclusion:** This study indicated that B19V is clearly circulating in the community in a way that is similar to what is found in most nontemperate countries.

Key words: Enzyme-linked immunosorbent assay, erythrovirus B19, Jeddah, Makkah, pregnant women, Saudi Arabia

INTRODUCTION

The family *Parvoviridae* is divided into two subfamilies named parvovirinae and densovirinae. Parvovirinae are subdivided into six genera termed: Parvovirus (PARV), dependovirus, erythrovirus, bocavirus, PARV4/PARV5, and amdovirus.[1] The B19 virus (B19V) is classified as a member of the erythrovirus genus because of its tropism for red blood cells and has been formally known since 2003, as erythrovirus B19 rather than PARV B19.[2] Viruses closely related to B19V have been isolated in recent years.[3] Some of these new isolates are now accepted as members of the erythrovirus genus. The identification of variant isolates within the human erythrovirus group has led to the division of human erythroviruses into three distinct genotypes: Genotype 1 (reference B19V strains); genotype 2 (LaLi and A6), and genotype 3 (V9).[4]

Infection by B19V is transmitted primarily through respiratory secretions. It can also be transmitted through infected plasma through blood transfusions, transplantation, or vertically from mother to fetus.[5]

The common clinical presentation of B19V infection is erythema infectiosum, which is characterized by a facial rash that spreads to the trunk and limbs, and is usually preceded by a nonspecific flu-like illness. B19V is also associated with arthropathy, aplastic crisis, and fetal infection.[6]

B19V infection in pregnant women can, but usually does not, lead to fetal infection. Fetal transmission occurs in approximately 33% of pregnant women infected with B19V. Fetal infection sometimes causes severe anemia due to hemolysis, leading to congestive heart failure, generalized edema (fetal hydrops), and death.[7] The risk

Access this article online	
Quick Response Code:	Website: www.jfcmonline.com
	DOI: 10.4103/2230-8229.181010

How to cite this article: Johargy AK. Seroprevalence of erythrovirus B19 in Saudi pregnant women. J Fam Community Med 2016;23:105-8.

of fetal death attributable to acute B19V infection during pregnancy is estimated to be <10%, ranging from 3% to 38% in different studies.[8]

The most common method for the detection of B19V-specific antibodies is enzyme-linked immunosorbent assay (ELISA). In this assay, B19V antigen is used to detect the presence of B19V immunoglobulin G (IgG) and IgM antibodies in serum. IgM is considered to be the first serological marker for B19V infection, detected 6–10 days after initial infection. IgG antibodies are produced approximately 12 days after infection and persist for life. The presence of IgG antibodies specific for B19V is indicative of a past infection.[9]

Little is known about the seroprevalence of B19V in Arab countries including Saudi Arabia. The aim, therefore, of this study was to determine the seroprevalence of B19V in Saudi pregnant women in the cities of Makkah and Jeddah of Saudi Arabia, and to compare the results to those of other countries.

MATERIALS AND METHODS

This study was carried out in the following hospitals: Maternity and Children Hospital and Hera General Hospital in Makkah city and King Abdul-Aziz University Hospital, Maternity and Children Hospital in Jeddah city between March 2014 and December 2014.

A total of 364 apparently healthy Saudi pregnant women (selected by simple random method) were included in this study.

An informed consent was obtained from each subject before inclusion in the study. 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. This study was performed at the Microbiology Laboratories at the Medical Colleges of Umm Al-Qura University, Saudi Arabia, and ethical approval was obtained from the Nursing College Ethical Review Board.

A sample of 10 ml of blood was collected from each of the pregnant women after informed consent. Serum was separated, aliquoted into two eppendorf tubes and stored at −20°C until testing. All pregnant women were investigated for previous infection with B19V by testing their sera for the presence of IgG antibody to B19V using a commercial ELISA (NovaTEC) (Immundiagnostica GmbH, Germany, Distributor: DiaSorin, Italy).

The seroprevalence results of B19V in Saudi pregnant women was statistically analyzed by calculating the mean, median, mode, standard deviation, range and p value, and distributed according to age differences using a Fisher test (GraphPad Instat programme statistical software, GraphPad Instat programme statistical software, GraphPad Software, Inc. San Diego, California, USA); $p < 0.5$ was considered significant.

RESULTS

A total of 364 pregnant women participated in the study. The age range of the pregnant women was 18–43 years, with a mean age of 27 years, median of 22 years, and standard deviation of 6.2 years. Of 364 Saudi pregnant women tested for the presence of B19V-specific-IgG antibodies, 182 (50%) were found to be positive, indicating prior exposure to B19V.

The prevalence of B19V-specific-IgG antibodies increased with age: The lowest prevalence (26.3%) was detected in pregnant women of <20 years of age reaching (62.5%) in those aged 38 or above, and this difference was statistically very significant ($p = 0.004$) (95% confidence interval: 0.2–0.8) [Table 1].

In addition, the likelihood of maternal transmission of B19V in case of infection in the light of the immunity status and the gestational age of women was determined. Women at risk of infection "seronegative women" with B19V were at different gestational ages [Table 2]. A total of 338 pregnant women were in their first trimester of pregnancy, out of these 168 (49.7%) were found to be at risk of infection with B19V. A further 26 women were in

Table 1: B19 virus immunoglobulin G among different age groups of Saudi pregnant women

Age (year)	Positive *N* (%)	Negative *N* (%)	Total *N* (%)
<20	10 (26.3)	28 (73.7)	38 (10.4)
20-25	62 (47.7)	68 (52.3)	130 (35.7)
26-31	56 (51.9)	52 (48.1)	108 (29.7)
32-37	34 (60.7)	22 (39.3)	56 (15.4)
38-43	20 (62.5)	12 (37.5)	32 (8.8)
Total	182 (50)	182 (50)	364 (100)

Table 2: The gestational age of women at risk of infection with B19 virus during pregnancy

Gestational age (trimester)	Positive *N* (%)	Negative *N* (%)	Total *N* (%)
First (1-12 weeks)	170 (50.3)	168 (49.7)	338 (92.9)
Second (13-27 weeks)	12 (46.2)	14 (53.8)	26 (7.1)
Third (28 weeks - delivery)	0 (0)	0 (0)	0 (0)
Total	182 (50)	182 (50)	364 (100)

their second trimester. Out of these 14 (53.8%) were found to be at risk of infection with B19V, but this difference was not statistically significant ($p = 0.8$) (95% confidence interval: 0.7–1.7).

DISCUSSION

B19V usually causes a mild disease. However, recent reports have described an association between B19V and severe illnesses with neurological[10] and cardiac[11] manifestations. 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 Saudi Arabia. In a study performed in Makkah and Jeddah cities of Saudi Arabia for B19V-specific-IgG in pediatrics patients, 80/400 had positive sera,[12] while in another study in Makkah city of Saudi Arabia, B19-specific-IgG antibodies were detected in 441/578 (76.3%) of Saudi blood donors of different age groups.[13]

Several studies had looked for the B19V seroprevalence in pregnant women. In a study in Sudan,[14] they found that 61.4% of the 500 pregnant women tested were immune for B19V. These findings were similar to those of another study,[15] carried out in Norway where the prevalence of B19V in 2000 pregnant women tested was 59.7%. However, in Iran,[16] the B19V seroprevalence in 86 pregnant women tested was slightly higher (75.6%). In our study, out of 364 serum samples from pregnant women tested, 182 were positive for B19V IgG (50%). Again this figure is lower than other reports from Sudan, Norway, and Iran where the B19V seroprevalence in pregnant women was found to be 61.4%, 59.7%, and 75.6%, respectively. However, it accords with a study[17] in Saudi Arabia in which the prevalence of B19V in 1200 pregnant women tested was 46.6%.

Although the seroconversion during pregnancy was not tested in this study, the outcome of maternal infection with B19V depends on gestational age at which the maternal infection occurs.[18] A total of 49.7% (168/338) and 53.8% (14/26) of B19V seronegative women in this study were at the first and second trimesters of gestation, respectively. Therefore, those B19V seronegative women are at a potential risk of fetal loss or hydrops fetalis if infected by B19V, as it was found that a significant B19V-associated risk of hydrops fetalis and/or fetal death is mainly restricted to maternal B19V infection between 9 and 20 weeks of gestation.[19]

Seroprevalence of IgG antibodies to B19V is known to be age dependent.[20] Similarly, our study showed an effect of age, since the prevalence (26.3%) was lowest in pregnant women of <20 years of age but reached 62.5% in those aged 38 or above.

In the light of the potential adverse outcomes associated with B19V infection in seronegative Saudi pregnant women, control of the possible perinatal transmission of this virus should be considered. This could perhaps be achieved by screening all Saudi pregnant women for B19V using prenatal serological tests and applying preventive measures such as the passive immunization of susceptible pregnant women after exposure to B19V with the commercially available intravenous PARV IgG antibodies. However, a full cost-benefit analysis would be required. Several reports have indicated the effectiveness of such passive immunizations in modifying the clinical course of the B19V disease.[21]

CONCLUSION

This study indicated that B19V is clearly circulating in the Saudi community in a way similar to that found in most countries with nontemperate climates. However, more studies on the prevalence of B19V in Saudi women in different cities of Saudi Arabia, particularly in those with complications and adverse outcomes of pregnancy are recommended.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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