

# PREVALENCE OF ANTIBODIES TO HUMAN PARVOVIRUS B19 IN SAUDI WOMEN OF CHILDBEARING AGE IN MAKKAH

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**هدف الدراسة :** أجريت هذه الدراسة لتحديد نسبة انتشار الأجسام المناعية بنوعيهما (ج) و (م) والمضادة لفيروس البارفو B19 لدى الأمهات السعوديات بمدينة مكة المكرمة.

**طريقة الدراسة :** تم جمع 1200 عينة من الأمهات أثناء الزيارة الجنينية الأولى وذلك لتقدير الأجسام المناعية المضادة لفيروس البارفو B19 بنوعيهما (ج) و (م) (IgG and IgM) وذلك باستخدام المقاييس النوعية الماصة والرابطة للإنزيم (ELISA).

**نتائج الدراسة :** من خلال عينة الدراسة (1200) وجد أن 560 (46.6%) يوجد لديهم أجسام مضادة لفيروس البارفو B19 من النوع (ج)، بينما 27 (2.25%) يوجد لديهم أجسام مضادة لفيروس البارفو B19 من النوع (م).

**الاستنتاج :** نستنتج من هذه الدراسة أن نسبة التعرض لفيروس البارفو B19 لدى الأمهات السعوديات في مدينة مكة المكرمة تمثل (46.6%) أما نسبة إصابة الأمهات بفيروس البارفو B19 فتتمثل (2.25%)، وهذه النسب في الواقع تقع ضمن النسب العالمية عند مقارنتها بالدراسات السابقة التي أجريت في الدول الأخرى.

**الكلمات المرجعية :** مكة المكرمة ، المملكة العربية السعودية ، النساء الحوامل ، فيروس البارفو B19 ، تقنية المقاييس المناعية الماصة والرابطة للإنزيم (ELISA).

**Objectives:** To determine the seroprevalence rate of immunoglobulin G (IgG) and immunoglobulin M (IgM) to parvovirus B19 in pregnant Saudi women in Makkah.

**Subjects and Methods:** Using enzyme-linked immunosorbent assay (ELISA), a total of 1200 serum samples were tested for antibodies to parvovirus B19 known to cause a variety of clinical syndromes in women and newborn infants.

**Results:** Parvovirus B19 IgG antibodies detected in 46.6% and IgM antibodies were found in 2.25% of different age groups.

**Conclusion:** The previous exposure to parvovirus B19 was determined, and 560 (46.6%) of 1200 pregnant Saudi women tested at their first antenatal visit were seropositive for specific IgG. The rate of maternal infection in susceptible pregnancies was 2.25%. These results were in accordance with previous studies performed in other countries.

**Key Words :** Makkah, Saudi Arabia, pregnant women, parvovirus B19, ELISA.

## INTRODUCTION

Parvovirus B19 is a single-stranded DNA-virus that was serendipitously discovered in the mid-1970s by Yvonne Crossart, a medical virologist, screening blood donors for hepatitis<sup>1</sup>. During electrophoresis, an abnormal band was noted in sample number 19, panel B. Therefore, the virus was named "B19", and subsequently identified as a parvovirus. Parvovirus B19 infection, an acute self-limiting disease also known as the fifth disease or erythema infection, commonly occurs in children of primary school age. The

typical rash ('slapped cheek' appearance) is immune mediated, since it coincides with the appearance of IgM and IgG specific antibodies.<sup>1</sup>

The virus binds to its cellular receptor, the P-antigen, and has a tropism for immature erythrocytes in the bone marrow or fetal liver.<sup>2</sup> Infection leads to an inhibition of erythropoiesis, resulting in anemia. Other tissues, such as the myocardium and endothelial cells, can also be affected.<sup>3</sup> Clinical signs are usually fever and rash, arthralgia or such signs as febrile illness with malaise. The infection can also be

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asymptomatic. In pregnant women, the virus is known to be associated with fetal anemia, fetal hydrops, spontaneous abortion and intrauterine fetal death (IUFD).<sup>4,5</sup> Several cases of IUFD caused by a combination of infection in the second or third trimester and hydrops are reported.<sup>6-9</sup> Parvovirus B19 has also been demonstrated to be a significant cause of mid-trimester abortions.<sup>10</sup>

However, most infections with parvovirus B19 remains asymptomatic, and therefore, the majority of exposed persons have no recollection of previous symptoms.<sup>11</sup> "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.<sup>12</sup> The prevalence of seropositivity to parvovirus B19 infection in pregnant women, in Saudi Arabia, has not been previously described. The aim, therefore, of this study was to determine the seroprevalence of parvovirus B19 in the obstetric population in Makkah, Saudi Arabia, and to compare the results to those of other countries.

## SUBJECTS AND METHODS

A total of 1200 randomly selected pregnant Saudi women in their first trimester attending the Maternity and Children's Hospital, Al-Noor Specialist Hospital, Hera General Hospital and King Abdul-Aziz General Hospital in Makkah city, for antenatal care were included in the study.

The study was carried out from November 2005 to October 2006. The age range of the patients was 16-45 years, with a mean age of 27 years. 10ml samples of blood were collected from each of the patients after informed consent. Serum was separated, aliquoted into two eppendorf tubes and stored at -20 °C until testing. Human serum IgG and IgM antibodies to parvovirus B19 were detected by enzyme-linked immunosorbent assay (ELISA) (EIA gen parvovirus B19 IgG kit, EIA gin parvovirus B19 IgM kit- Adaltis, Italia).

### Ethical Consideration

An informed consent was obtained from each individual before inclusion in the study. Every subject had been informed about the procedure before the blood sample was collected, making

absolutely certain that she understood the procedure to be carried out. These subjects were also made aware that they could refuse to participate in the study without prejudice.

## RESULTS

Of the 1200 women who were tested for the presence of specific IgG antibodies 560 women (46.6%) tested positive for parvovirus B19 antibodies in the first trimester of pregnancy, implying immunity for parvovirus (Table 1). Twenty-seven (2.25%) women tested positive for IgM parvovirus B19 antibodies in the first trimester of pregnancy. The seroprevalence of IgG and IgM for parvovirus B19 specific IgG and IgM antibodies among different age groups increased with age: the lowest prevalence respectively (33.6%) (0.81%) was detected in women between 16-20 years of age reaching (53.9%) in those above the age of 36 for IgG antibodies and (3.92%) for IgM in women above the age of 40 (Table 2).

*Table 1: IgG and IgM seropositivity for parvovirus B19 in Saudi pregnant women in Makkah*

No. of antenatal sera tested	No. of positive IgG (%)	No. of positive IgM (%)
1200	560 (46.6)	27 (2.25)

*Table 2: Parvovirus B19 IgG and IgM among different age groups of Saudi pregnant women in Makkah*

Age groups	No. of positive IgG/No. tested (%)	No. of positive IgM/No. tested (%)
16-20	41/122 (33.6)	1/122 (0.8)
21-25	122/281 (43.4)	5/281 (1.8)
26-30	183/381 (48.0)	7/381 (1.8)
31-35	110/213 (51.6)	7/213 (3.3)
35-40	82/152 (53.9)	5/152 (3.3)
41-45	22/51 (43.1)	2/51 (3.9)

## DISCUSSION

Infection with parvovirus is common worldwide. The yearly peak incidence of infection occurs in the spring and epidemics occur every 4 years.<sup>13</sup> The prevalence of IgG antibodies directed against B19 in the population ranges from 2 to 15% in children 1-5 years old, 15-60% in children 6-19 years old, 30-60% in adults and more than 85% in the geriatric population.<sup>14</sup> About 35-45% of women of childbearing age do not possess protective IgG antibodies against B19.<sup>15</sup> The incidence of acute B19 infection in pregnancy is approximately 1-2% in endemic periods, but in epidemic periods the infection rate may rise to >10%.<sup>16-18</sup>

The prevalence of parvovirus B19 infection in pregnant women, in Saudi Arabia and other countries in the Arabian Gulf (except Kuwait) has not been described previously. In Kuwait, England, USA, Spain and Japan, the prevalence was found to be 53.3, 53, 49.7, 35 and 33% respectively.<sup>19-23</sup> In our study, seropositivity was found in 46.6%, which is similar to other studies. This is lower than the 81% reported in one area of Sweden between 1990-1991.<sup>24</sup>

The overall seroprevalence for IgG and IgM of parvovirus B19 in pregnant Saudi women in Makkah city was 46.6 and 2.25% respectively (Table 1). Seroprevalence of IgG antibodies to B19 is known to be age dependent.<sup>19</sup> Similarly, our study showed an effect of age, in both IgG parvovirus B19 seroprevalence and the incidence of seropositive IgM (Table 2). The incidence of acute infection in our obstetric population was 2.25%, which is comparable to previous reports.<sup>19-22</sup>

Parvovirus B19 infection is difficult to prevent since the infection is frequently asymptomatic and exposure is common during epidemics. Preventing the infection in pregnancy would be one possible application of the present candidate vaccine.<sup>25</sup> Recently, Ballou et al (2003) described a recombinant parvovirus B19 vaccine composed of VP1 and VP2 capsid protein, which proved to be immunogenic and safe to use in human volunteers.<sup>26</sup> Vaccination of non-immune pregnant women could be a highly effective method of preventing fetal infection with B19. However, the cost-effectiveness of this strategy in the general population is uncertain. This study may also suggest that there is a need to launch an awareness program for pregnant women. Additional studies of this nature should be encouraged to improve the knowledge of the Saudi population about the risks of exposure of pregnant women to parvovirus B19.

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