SEROPREVALENCE OF ERYTHROVIRUS B19 IgG AMONG SAUDI BLOOD DONORS IN MAKKAH, SAUDI ARABIA

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هدف الدراسة : أجريت هذه الدراسة لتحديد نسبة انتشار الأجسام المناعية نوع (ج) والمضادة لفيروس الايريثرو B19 لدى المتبرعين بالدم السعوديين بمدينة مكة المكرمة.
طريقة الدراسة : تم جمع 578 عينة من المتبرعين بالدم السعوديين بمدينة مكة المكرمة وذلك لتقدير الأجسام المناعية المضادة لفيروس الايريثرو B19 نوع (ج) (IgG) وذلك باستخدام المقايسة النوعية الماصة والرابطة للإنزيم (ELISA) .
نتائج الدراسة: من خلال عينة الدراسة (578) وجد أن 441 (76.3%) يوجد لديهم أجسام مضادة لفيروس الايريثرو B19 من النوع (ج).
الاستنتاج : نستنتج من هذه الدراسة أن نسبة التعرض لفيروس الايريثرو B19 لدى المتبرعين بالدم السعوديين في مدينة مكة المكرمة تمثل (76.3%)، وهذه النسبة في الواقع تقع ضمن النسب العالمية عند مقارنتها بالدراسات السابقة التي أجريت في الدول الأخرى .

الكلمات المرجعية : مكة المكرمة ، المملكة العربية السعودية ، المتبرعين بالدم ، فيروس الايريثرو B19 ، تقنية المقايسة المناعية الماصة والرابطة للإنزيم (ELISA) .

Objectives: *To determine the seroprevalence of immunoglobulin G (IgG) to erythrovirus B19 in Saudi blood donors in Makkah. Saudi Arabia.*
Subjects and Methods: *A total of 578 blood (serum) samples were tested for erythrovirus B19-specific-IgG antibody among Saudi blood donors in Makkah. Saudi Arabia.*
Results: *Erythrovirus B19-specific-IgG antibodies were detected in 441/578 (76.3%) of Saudi blood donors of different age groups.*
Conclusion: *This study indicated that 76.3% of Saudi blood donors in Makkah city, Saudi Arabia, had been exposed to erythrovirus B19. This result is in accordance with previous studies performed in other countries.*

Key Words : *Makkah, Saudi Arabia, blood donors, erythrovirus B19, ELISA.*

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INTRODUCTION

The family *Parvoviridae* is divided into two subfamilies named *Parvovirinae* and *Densovirinae*. *Parvovirinae* are subdivided into six genera termed: *parvovirus, 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 Parvovirus 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]

The B19V virion has a simple structure composed of two proteins and a linear, single-strand DNA molecule.[5]

The cellular receptor for B19V has been identified as the erythrocyte P antigen. Erythrocyte P antigen is expressed mainly on mature erythrocytes and erythroid progenitor cells.[6]

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Infection by B19V is transmitted primarily through respiratory secretions. It can also be transmitted through infected plasma via blood transfusions, transplantation or vertically from mother to foetus.[7]

The common clinical presentation of B19V infection is erythema infectiosum, which is characterized by a facial rash that spreads to the trunk and limbs, usually preceded by a non-specific flu-like illness. B19V is also associated with arthropathy, fetal infection and aplastic crisis.[8].

The aplastic crisis that occurs in patients with chronic haemolytic anaemia is characterised by a fall in haemoglobin level to as low as 4g/dl, a disappearance of reticulocytes from the blood, and the absence of blood cell precursors in the bone marrow. The patient has a viral-like illness with fever and constitutional symptoms, followed by the onset of fatigue and anaemia. The event is serious in most patients and is occasionally fatal. However, the patient usually quickly recovers within a week, the haemoglobin recovering to normal levels.[9]

The most common method for the detection of B19V specific antibodies is ELISA. In this assay, B19V antigen is used to detect the presence of B19V IgG and IgM antibodies in serum. IgM is considered to be the first serological marker for B19V infection, detected 6 to 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 past infection.[10] 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 blood donors in Makkah, Saudi Arabia, and to compare the results to those of other countries.

SUBJECTS AND METHODS

The present study was carried out at four main blood banks in the following hospitals in Makkah: Al-Noor Specialist Hospital, Hera General Hospital, King Abdul-Aziz General Hospital and King Faisal General Hospital between November 2006 and October 2007.

A total of 578 apparently healthy Saudi male blood donors (selected by simple randomization method) were included in this study. The age range of the blood donors was 18-55 years, with a mean age of 30 years, median of 28 years, mode of 23 years and standard deviation of 8.5 years.

Donors were selected after a thorough physical examination and the completion of the donor's questionnaire. The exclusion criteria of donors were: age < 18 years or > 55 years, weight < 55 kg, hemoglobin < 13g/dl, history of jaundice, sickle cell disease, glucose-phosphate dehydrogenase deficiency, diabetes, hypertension, history of recent fever, and a visit to a malaria endemic area within the last year.

None of the blood donors were on immunosuppressive drugs nor had a history of organ transplant. All donors enrolled in this study were also tested for HBV, HCV, HIV 1,2 antibodies, HIV p24 antigen, HTLV I/II by ELISA, malaria by thin and thick film and syphilis by RPR and TPHA.

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.

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

The seroprevalence results of B19V in Saudi blood donors was statistically analysed by calculating the mean, median, standard deviation, range and p value, and distributed according to age differences using a Fisher test (Graph Pad Instat programme statistical software). P-values of less than 0.5 were considered significant.

RESULTS

Overall B19Vseroprevalence

Out of 578 Saudi blood donors tested for the presence of B19V-specific IgG antibodies, 441 (76.3%) were found to be positive, indicating prior exposure to B19V. The prevalence of B19V-specific IgG antibodies increased with age: the lowest prevalence (68%) was detected in blood donors of less than 20 years of age reaching (82.6%) in those aged 50 or above, but this

difference was not statistically significant (p-value = 0.3) (Table 1).

Table 1: *B19V IgG among different age groups of Saudi blood donors*

Age category (Year)	Positive (%)	Negative (%)
<20	17 (68.0)	8 (32.0)
20-29	226 (78.7)	61 (21.3)
30-39	118 (69.8)	51 (30.2)
40-49	61 (82.4)	13 (17.6)
≥ 50	19 (82.6)	4 (17.4)
Total	**441 (76.3)**	**137 (23.7)**

DISCUSSION

B19V usually causes a mild disease; however, recent reports described an association between B19V and severe illnesses with neurological[11] and cardiac[12] manifestations. Because of the epidemic nature of the circulation of B19V and its potential as a cause of serious disease, interest in B19V seroprevalence has risen throughout the world.

Seroprevalence of B19V in developed countries is 2-10% in children less than 5 years, 40-60% in adults over than 20 years, 60% in blood donors, and 85% or more in those over 70 years.[10]

B19V is recognised as a major contaminant of blood and blood products.[13] In addition, because the virus is resistant to different inactivation methods, most final blood products that contain B19V DNA are potentially infectious.[14] Seroconversion was observed in volunteers receiving SD-treated pooled plasma containing high titres of B19V DNA.[15] The Food and Drug Administration (FDA) recommend testing plasma pools by PCR and discarding those with a B19V viral load of >104 genome equivalent /ml.[16]

Furthermore, a recent report[17] of a cross-sectional study suggests the existence of persistently B19V infected blood donors and the fact that 1% of blood donors carried B19V DNA in the presence of specific IgG antibodies.

The aim of this study was to measure the seroprevalence of B19V-specific-IgG antibody in Saudi blood donors in Makkah.

Of the serum samples of 578 blood donors tested in our study, 441 were positive for B19V-specific-IgG antibody (76.3%). This prevalence was in accordance with B19V specific-IgG antibody seroprevalence in blood donors in Belgium[18] (74%) and Italy[19] (79.1%), though it was higher than the B19V specific-IgG antibody seroprevalence reported of blood donors in Egypt[20] (26%), Yemen[20] (46%) and Japan (45%).[21]

Seroprevalence of IgG antibodies to B19V is known to be age dependent.[22,23] Similarly, our study showed an effect of age, since the prevalence (68%) was lowest in blood donors less than 20 years of age but reached 82.6% in those aged 50 or above.

In conclusion, our study indicated a high prevalence of B19V-specific-IgG antibodies in Saudi blood donors in Makkah, Saudi Arabia, which increased with age. However, more studies on the prevalence of B19V in different cities of Saudi Arabia are recommended. In addition, we recommend that the health authorities take the advice of the Food and Drug Administration (FDA) and test plasma pools of blood donors by PCR and discard those with a B19V viral load of >104 genome equivalent /ml.

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