Journal of Infection (1993) **27**, 51–55

SHORT COMMUNICATION

IgG and IgM antibodies to human parvovirus B19 in the serum of patients with a clinical diagnosis of infection with the virus and in the general population of Saudi Arabia

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Accepted for publication 8 *February* 1993

Summary

A total of 56 samples of serum from 32 patients with a clinical diagnosis of human parvovirus B19 infection were tested for specific immunoglobulin G (IgG) and M (IgM) antibodies by means of the recently available indirect enzyme-linked immunosorbent assay (ELISA) (Parvoscan-B19, Ferring Diagnostica, Sweden). The assay was also used in order to determine the age-specific prevalence of antibodies to the virus in the general population of Saudi Arabia. Specific IgM antibodies were detected in 94% specimens collected 1 week after the onset of illness and could be detected for up to 2 months. On the other hand, specific IgG antibodies were detected in 85% patients from whom acute- and convalescent-phase serum samples were collected. Saudis begin to be exposed to human parvovirus B19 early in life and prevalence of exposure increases with age in both sexes (overall prevalence 19·0%). The availability of a commercial ELISA makes it possible to diagnose infection with the virus routinely and will help in establishing the extent of exposure to it in various communities.

Introduction

Human parvovirus B19 was discovered in 1975 in samples of serum from healthy blood donors.[1] Since its discovery, the virus has been shown to be the causative agent of erythema infectiosum (fifth disease) and transient aplastic crises in patients with chronic haemolytic anaemia.[2–4] It is also the aetiological agent of some cases of acute arthritis, chronic anaemia in immunodeficient persons as well as fetal death.[5–10] Infection may be diagnosed by detection of specific IgG and IgM antibodies and more recently by means of the polymerase chain reaction.[11–12] In this report, we describe the serum IgG and IgM antibody responses in 32 Saudi patients with rashes and/or arthritis compatible with a clinical diagnosis of infection with human parvovirus B19. Also we have tried to determine age-specific prevalence of infection with the virus in the Saudi population using the recently developed ELISA for detecting specific antibodies to the virus.

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0163-4453/93/040051+05 $08.00/0

Table I *Class-specific antibodies (IgM and IgG) in 32 patients with a clinical diagnosis of infection with human parvovirus B19*

Time of collection of specimen after onset of illness	1 week		3 weeks–2 months		> 2 months–4 months	
Antibody sought	IgM	IgG	IgM	IgG	IgM	IgG
No. positive/total no. tested	30/32	12/32	7/7	7/7	8/20	17/20
Percentage positive	94%	73·5%	100%	100%	40%	85%

Materials and methods

Serum samples

These consisted of: (1) 56 samples from 32 patients with a clinical diagnosis of infection with human parvovirus B19; and (2) 517 samples from apparently healthy Saudis of various ages. The patients were seen at King Khalid University Hospital, Riyadh, Saudi Arabia. Their average age was 18 years (range 2–40 years). The children in the apparently healthy Saudi group were seen at the hospital for routine vaccinations, while the adult males were blood donors and the adult females were pregnant women attending the antenatal clinic at the same hospital.

Parvoscan-B19 (Ferring Diagnostica, Sweden)

This was an indirect ELISA performed in microwells of plastic plates. The wells were coated with a human parvovirus B19-specific synthetic peptide corresponding to a part of the parvovirus proteins (VP1 and VP2). The procedure specified by the manufacturer was followed. All samples were tested in duplicate and were considered positive for IgG or IgM antibody if they were repeatedly reactive at least twice.

Results

Antibody responses (specific IgG and IgM antibodies) of 32 patients with a clinical diagnosis of human parvovirus B19 infection are shown in Table I. Specific IgM antibodies were positive in 94% specimens collected about 1 week after the onset of illness. Only seven samples were available after 3 weeks to 2 months post infection. Specific IgM antibodies were present in all of them. After 2 months, there was a rapid decline in specific IgM antibody (only 40% samples were positive) in contrast to a sharp increase in specific IgG (85% positive). One patient in whose serum specific IgG antibodies were not found after 3 months did not have detectable IgM antibodies 1 week after onset of illness and therefore was probably not infected with human parvovirus B19.

Age-specific prevalence of IgG and IgM antibodies to human parvovirus B19 in 517 apparently healthy Saudis is shown in Table II. Prevalence of specific IgG antibodies increased with age in both sexes with an overall prevalence of 19%. Specific IgM antibodies were detected in 1·2% of the males and 0·8% of the females, mainly in children less than 10 years of age.

Table II *Prevalence of IgG and IgM antibodies to human parvovirus B19 in the serum of apparently healthy Saudis of various age groups*

Age group (years)	Males	IgG	IgM	Females	IgG	IgM	Total	IgG	IgM
1–5	17	3	1	12	1	1	29	4	2
6–10	28	7	1	21	5	1	49	12	2
11–20	40	4	0	30	3	0	70	7	0
21–30	50	10	1	70	5	0	120	15	1
31–40	50	11	0	62	10	0	112	21	0
40–50	45	10	0	30	8	0	75	18	0
> 50	30	13	0	32	8	0	62	21	0
Total	260	58	3	257	40	2	517	98	5
(%)		(22·3)	(1·2)		(15·6)	(0·8)		(19·0)	(1·0)

Discussion

The results of this study demonstrate that the Parvoscan-B19 ELISA was useful for diagnosing acute infection with human parvovirus B19. Detection of specific IgM antibodies in single samples of serum was of greatest diagnostic value since 94% persons with clinical evidence of infection had specific IgM antibodies. On the other hand, only 1·0% of the apparently healthy population in whom age-specific prevalence of human parvovirus B19 infection was studied were positive for specific IgM antibody. The finding of specific IgM antibody in persons of this group suggests either that they had recently been exposed to the virus or currently had inapparent infection. None of those with IgM antibodies to human parvovirus B19 were positive for anti-rubella virus IgM or rhumatoid factor. Furthermore, our finding that specific IgM antibodies could still be detected 1 to 2 months after clinical infection accords with the work of others[12] and indicates that samples of serum may still be of diagnostic value if obtained within that period after the onset of illness.

The Parvoscan-B19 IgG test was also useful as a diagnostic test since a significant rise in B19-specific IgG antibodies was detected in 85% cases in which paired samples of serum were appropriately collected. The Parvoscan-B19 IgG test was also applied to study the rate of exposure to the virus in the general population. Our results showed that exposure in the Saudi population starts early in life and increases with age with an overall prevalence of 19·0%. There was no significant difference in the exposure rate between the various age groups of the two sexes. Although a similar pattern has been reported in other communities, it was surprising to us that the overall prevalence in the Saudi population (19·0%) was lower than that reported for populations in Europe, the United States, Japan and Brazil (30–60% in people $\geqslant$ 19 years of age).[13–16]

In contrast to rubella and cytomegalovirus[17] infections, most of the women attending the antenatal clinic had not been exposed to human parvovirus B19. Hence, many are susceptible to infection by the virus. Its role in causing fetal death (both spontaneous abortions and stillbirths)[18] is currently under

investigation. Our preliminary data based on the presence of IgM antibodies in the blood of mothers who had recently suffered spontaneous abortion indicate that an adverse effect of the virus in pregnancies among Saudi women should not be underestimated.

The results of this study accord with those of others[12,19,20] in which IgM and IgG ELISA were found to be the best method so far for diagnosing current and past infections with human parvovirus B19, respectively. To our knowledge, this is the first report on the exposure to human parvovirus B19 among the Saudi population. The recent commercial availability of an ELISA diagnostic test for detecting class-specific antibodies to the virus makes it possible to accurately diagnose infections caused by the virus and will help in establishing the extent of exposure to it in various communities.

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