

Research Article



Investigation of Parvovirus B19 IgG Antibodies in a Group of Children in Damascus, Syria

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Accepted on: 22-05-2014; Finalized on: 31-07-2014.

ABSTRACT

Parvovirus B19 (B19V) infects children and adults, causing erythema infectiosum, polyarthritis, aplastic crisis and chronic anemia in patients with hematological or immunological disorders, and fetal hydrops or fetal death. This study aims to estimate the prevalence of B19V IgG antibodies in a group of children in Damascus, Syria. Specimens were obtained randomly from 280 children (139 males and 141 females) aged 1 to 17 years. Specimens were collected from Damascus Children Hospital between January 2013 and April 2013. B19V specific IgG antibodies were detected by a commercial indirect enzyme-linked immunosorbent assay in sera. Of the 280 children, 83 (29.64%) were seropositive for B19 IgG antibody. The difference in the prevalence of B19 IgG antibodies between genders was not statistically significant ($p=0.84$). The prevalence of antibodies increased significantly in the age group of 10–17 years compared to younger patients ($p=0.012$). This study revealed an influence of geographic differences on transmission of parvovirus B19, and detected the increase of B19 IgG antibodies with age. The study also showed that there was no relationship between seropositivity and sex.

Keywords: Damascus, Syria, Parvovirus B19, Seroprevalence, Children, ELISA, IgG antibodies.

INTRODUCTION

Human parvovirus B19 was discovered by Cossart et al, while they were evaluating assays for hepatitis B virus in serum.¹ Parvoviruses are small, round viruses with a single-stranded DNA genome that lack a lipid envelope. Among the parvoviruses, B19V is the first known pathogenic human parvovirus.¹ The virus is mainly transmitted by personal contact via aerosol or respiratory secretions. Contaminated blood products, such as clotting factor concentrates, are also source of iatrogenic transmission.² B19 virus can be transmitted transplacentally from an infected mother to the fetus, leading to non-immune fetal hydrops (NIHF), spontaneous abortion, or intrauterine fetal death.³ In children the most common clinical presentation of Parvovirus B19 infection is "fifth disease" or "erythema infectiosum", an illness characterized by a non-specific prodromal phase, followed by the typical "slapped cheek" rash. Although joint symptoms are rare in children, they are more common in adults and generally in women. Joints become painful and swollen, and often symmetrically affect the wrists, knees and small joints of the hands.^{2,3} Although the infection is endemic, regional epidemics are reported preferentially during late winter and spring. Parvoviruses B19 infection is common in childhood and adolescence, continues at a low rate throughout adult life, and by the time they are elderly, most people are seropositive.³ IgM antibodies present 10 to 12 days postinfection, coinciding with a peak in virus level.² IgG antibodies can be detected in serum 2-3 weeks after acquisition of infection and last for life, providing immunity against re-infection.⁴

In developed countries seroprevalence characterized by IgG against the viral capsid proteins VP1 and VP2 has

been reported as being about 2-21% in children aged 1-5 years, 30-40% in adolescents (aged 15 years) and 40–60% in young adults (aged 20 years) and may reach maximum levels in the elderly with over 90%.⁵

The prevalence of seropositivity to parvovirus B19 infection in children, in Syria, has not been previously described. The aim, therefore, of this study was to determine the seroprevalence of parvovirus B19 in a group of children in Damascus, Syria, to relate them to age and gender and to compare the results to those of other countries.

MATERIALS AND METHODS

Samples

After an informed consent was obtained from the parents of each child, a total of 280 randomly selected paediatric patients' samples (male/female, 139/141) were collected from Damascus Children Hospital between January 2013 through April 2013. Children with hematological or immunological disorders were excluded. A sample of 5 ml of blood was collected from each child. Sera were obtained, aliquoted into 3 Eppendorf tubes and stored at -80°C until testing.

Methods

B19 IgG ELISA

The serum samples were tested for the presence of B19 virus IgG specific antibodies, using a commercial indirect ELISA (Novatec; Immunodiagnostic GmbH, Germany, Distributor: DiaSorin, Italy) according to the manufacturer's instructions. The study was performed in Damascus University Blood Center.



Briefly, sera were diluted 1+100 with IgG Sample Diluent and incubated for 60 min at 37° C on a specific antigen precoated 96 well plate.

After washing, horseradish peroxidase conjugated anti-human IgG was used as a second antibody (incubation 30 min at room temperature). Tetramethylbenzidine (TMB) was added after an additional washing and incubated for exactly 15 min at room temperature in the dark. The reaction was stopped with 0.2 M sulphuric acid solution after 15 min and the absorbance of the specimen were measured at 450/620 nm within 30 min after addition of the Stop Solution.

Samples are considered **positive** if the absorbance value is higher than 10% over the cut-off, while that with an absorbance value of 10% above or below the cut-off should be considered as **grey zone**. Samples with absorbance value lower than 10% below the cut-off are considered **negative**.

Statistical analyses

To analyze the data, the statistical package for social sciences (SPSS) was used.

A p-value of <0.05 was used as the cut-off level for significance.

RESULTS

Among the 280 children tested, 83 (29.64%) were seropositive for B19 IgG antibody. The remaining 197 (70.36%) were negative and therefore susceptible to parvovirus B19 infection.

The overall seropositive rate of IgG for males and females was 30.22% (42/139) and 29.08% (41/141) respectively. There was no difference in seropositivity rates between males and females ($p=0.84$). As shown in table 1, the seroprevalence of parvovirus B19 increased significantly with age and ranged from 8.43% in 1-4 years old group to 51.81% in 11-17 years old group ($p=0.012$) indicating age-dependence.

Table 1: Seroprevalence of B19V specific IgG antibodies in children according to age groups in Syria, 2013

Age group	Positive	Negative	Total	%
1 - 4 years	7 (12.28%)	50 (87.72%)	57 (100%)	8.43
5 - 10 years	33 (25.38%)	97 (74.62%)	130 (100%)	39.76
11 - 17 years	43 (46.24%)	50 (53.76%)	93 (100%)	51.81
Total	83	197	280	100

DISCUSSION

The prevalence of seropositivity to parvovirus B19 infection in children in Syria has not been described previously. In our study seropositivity to parvovirus B19 IgG antibodies was found in 29.64%, which is similar to a study in England and Wales where the seroprevalence of parvovirus B19 in children was 27%.⁶ However, our findings were higher than the 20% reported in Makkah and Jeddah, Kingdom of Saudi Arabia⁶, and the 20.7% reported in Central Anatolia Region, Turkey.⁷

It was lower than the 51.6% in Israel⁸, and Poland.⁹ This difference in rates could be explained by more exposure to the B19V in previous countries due to the difference in geographical environment from ours.

Our study demonstrated significantly B19 IgG seroprevalence increase from 12.28% at 1–4 years to 46.24% at 11–17 years. This finding was compatible with previous studies⁶⁻⁹, and suggested that infection principally occurs during the school years. This suggestion is supported by study in Makkah and Jeddah, Kingdom of Saudi Arabia⁶, and by a study from Denmark which proved that the highest risk of B19V infection occurs in houses that contain school-aged children, and that the susceptibility to get infection increases with the number of school-aged children per family.¹⁰ Moreover, statistical analysis of the data using the linear forecast trendline shows that the seroprevalence is also expected to

increase with age in individuals over 17 years old (figure 1).

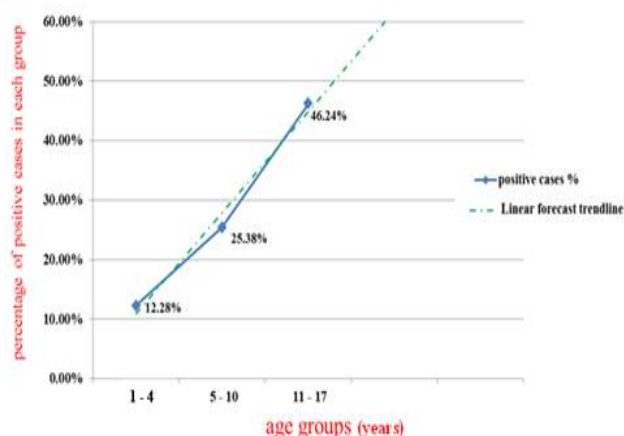


Figure 1: Linear chart reveals percentage of positive cases in each age group, with predictive line elucidates the increase of positivity in older people.

The difference in the seroprevalence rate of parvovirus B19 between males and females was not significant. This goes in line with the data from the children population in Makkah and Jeddah, Kingdom of Saudi Arabia and Rio de Janeiro indicating no difference in the prevalence of IgG antibodies between genders.^{6,11}

CONCLUSION

This study has identified for the first time the seroprevalence of parvovirus B19 in the children population in Damascus, and has found that the age is a significant factor in relation to such seropositivity, but did not show significant effect of gender.

Acknowledgments: The authors are grateful for the financial support provided by the Faculty of Pharmacy, Damascus University, Damascus Children Hospital, and Damascus University Blood Center.

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Source of Support: Nil, Conflict of Interest: None.

