

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Prevalence of Antibody to Human Parvovirus B19 in Pre-School Age/young Adult Individuals in Shiraz, Iran

Mazyar Ziyaeyan, Bahman Pourabbas, Abdolvahab Alborzi and Jalal Mardaneh
Professor Alborzi Clinical Microbiology Research Center,
Shiraz University of Medical Sciences, Shiraz, Iran

Abstract: The present study was conducted to determine the prevalence of antibody against the human parvovirus B19 among 5-25 year old individuals in Shiraz, southern Iran. Serum samples from 908 individuals (505 female and 403 male) were studied. The patients were categorized into seven age groups. The IgG anti-parvovirus B19 was determined by the commercial ELISA kit. Anti-parvovirus B19 IgG was found in 70.09% of the females and 60.04% of the males in this study. In general, 65.63% of the study population had IgG against parvovirus B19. Results from this study have show that the prevalence of parvovirus infection is found to be higher in females than males and in the majority of cases, infection with parvovirus occurs in the pre-school age period. These findings may differ from what is found other countries.

Key words: Parvovirus B19, seroepidemiology, ELISA

INTRODUCTION

Human parvovirus B19 is a single stranded DNA-virus that was serendipitously discovered in the mid-1970s by Crossart, medical virologist, while screening blood donors for hepatitis (Cossart *et al.*, 1975). The virus is widespread and manifestations of infection vary with the immunologic and hematologic status of the host. Parvovirus B19 infections cause an acute and self-limiting disease known as erythema infectiosum or fifth disease in healthy immunocompetent children. The typical rash ('slapped cheek' appearance) is immune mediated, since it coincides with the appearance of specific antibodies (Heegaard and Brown, 2002). A variety of further manifestations are associated with the infection such as arthralgias, arthritis, leukopenia and vasculitis, spontaneous thrombocytopenia, anemia and abortion and hydrops fetalis in pregnant women (Anand *et al.*, 1987; Chisaka *et al.*, 2003; Kyriazopoulou *et al.*, 1997; Lefrere *et al.*, 1986; Plentz *et al.*, 2004; Reid *et al.*, 1985). In industrialized countries, about 40-50% of women of childbearing age have no detectable immunoglobulin G (IgG) against parvovirus B19 and are susceptible to infection (Rodis, 1999). The virus is particularly threatening to the fetus since it has a unique affinity for a cellular receptor (P-antigen) in fetal erythroid precursor cells in fetal liver (Heegaard and Brown, 2002). The aim of

this study was to investigate the large seroprevalence of parvovirus B19 among individuals aged 5-25 years, since there has been limited information available on the prevalence of antibodies to parvovirus B19 in our region.

MATERIALS AND METHODS

Study population and procedures: This cross-sectional study was carried out during the period of June to October 2005 at the Professor Alborzi Clinical Microbiology Research Center in Shiraz, southern Iran to assess the parvovirus B19 seroepidemiology. The study population consisted of 908 consecutive immunocompetent individuals including 403 males and 505 females, 5-25 years of age (mean±SD: 15.07±5.4), who visited the general medical outpatient ward. A 5 mL blood sample was collected from each study subject and serum samples were separated and stored at -20°C until examination.

Serology: anti-parvovirus B19 IgG was measured by a commercial enzyme immunosorbent assay (IBL, Germany). The procedure and interpretation of the results (positive or negative) were as recommended by the manufacturer.

Statistical analysis: The data were compared with the Chi-square test and differences with a p value of <0.05 were considered statistically significant.

Table 1: Prevalence of IgG antibodies to Human Parvovirus B19 by age and gender in healthy individuals

| Age group (year) | Male | | Female | | Male and female | |
|------------------|------------|------------------|------------|------------------|-----------------|------------------|
| | No. tested | No. positive (%) | No. tested | No. positive (%) | No. tested | No. positive (%) |
| 5-7 | 39 | 25 (64.1) | 32 | 21 (65.6) | 71 | 46 (64.8) |
| 8-10 | 80 | 48 (60.0) | 76 | 53 (69.7) | 156 | 101 (64.7) |
| 11-13 | 76 | 36 (47.4) | 79 | 47 (59.5) | 155 | 83 (53.5) |
| 14-16 | 65 | 30 (46.2) | 87 | 58 (66.7) | 152 | 88 (57.9) |
| 17-19 | 64 | 47 (73.4) | 81 | 61 (75.3) | 145 | 108 (74.5) |
| 20-22 | 41 | 30 (73.2) | 84 | 65 (77.4) | 127 | 95 (74.9) |
| 23-25 | 38 | 26 (68.4) | 64 | 49 (76.6) | 102 | 75 (73.5) |
| Total | 403 | 242 (60.04) | 505 | 354 (70.09) | 908 | 596 (65.63) |

RESULTS

The 908 serum samples were divided into seven age groups each containing from 71 to 156 samples (mean±SD: 129.7±32.4). The female/male ratio of the study group was 505/403. The age-related prevalence of IgG antibodies to parvovirus B19 in each of the seven age groups is shown in Table 1. Five hundred ninety-six of the 908 study subjects were seropositive for B19 IgG antibody. The antibody prevalence in each group was as follows: 5-7 year-olds: 64.8%; 8-10 year-olds: 64.7%; 11-13 year-olds: 53.5%; 14-16 year-olds: 57.9%; 17-19 year-olds: 74.5%; 20-22 year-olds: 74.9% and 22-25 year-olds: 73.5%. The seroprevalence in individuals in the age range of 11-16 years was notably lower than that of the individuals 17 years of age and older and 10 years of age and younger ($p = 0.0001$). A notable increase in seropositivity rate was observed from 14-16 to 17-19 years of age. The overall gender difference in seroprevalence of parvovirus B19 infection was significant with 60.04% (242/403) of males and 70.09% (354/505) of females being IgG-antibody positive ($p = 0.002$). The seroprevalence of parvovirus IgG was differed among the male age groups ($p = 0.003$), but the difference was not statistically significant among the female age groups ($p = 0.198$).

DISCUSSION

Seroepidemiologic studies have shown that infection with human parvovirus B19 is worldwide and the seropositive rate of B19 IgG antibody varies by location and time of the last B19 epidemic (Anderson *et al.*, 1986). In Japan, the seropositive rate was reported to be 20% in the young age groups of <20 years and >80% in the old age groups of >60 years (Yamashita *et al.*, 1992). Another study in Japan showed a 46% prevalence rate of B19 IgG antibody in 20-39 year-old women (Yaegashi *et al.*, 1999). In England and Wales, the seropositive rate was 5-15% in the young age groups of 1-5 years, 50-60% in older children, young adults and women of childbearing age and >85% in the old age group of >70 years (Cohen and

Buckley, 1988). In the US, the seropositive rate was 2% in the young age group of <5 years and 49% in adults aged >20 years (Anderson *et al.*, 1986). In Kuwaiti pregnant women, the prevalence of parvovirus B19 infection was reported to be 53.3% (Maksheed *et al.*, 1999). An earlier study in Iran also showed that the prevalence of antibodies to parvovirus B19 among women in child bearing age was 66.5% (Ziyaeyan *et al.*, 2005).

In the present study, a high prevalence of antibody was observed in the study population; thus, it is likely that most individuals acquired infection during the first seven years of life. The highest antibody prevalence reached up to 73.5% at the third decade of life. In some previous studies, especially in East Asia, a lower prevalence rate was found in young adults (20-29 years) (Lin *et al.*, 1999; Yamashita *et al.*, 1992). The result of this study is nearly similar to those observed in western countries with the high prevalence rate of 49% in the USA (Anderson *et al.*, 1986) and 50-60% in the UK among young adults (Cohen and Buckley, 1988).

In 5-10 year-old individuals, the prevalence of anti-parvovirus antibody was slightly higher than those 11-16 year-old individuals, which might be due to a recent outbreak of parvovirus B19 infection among pre-school /primary school aged children in our area. In this study the prevalence of parvovirus infection was found to be higher in females than males. Some previous studies support this result, (Lin *et al.*, 1999) but some others show no difference in males and females in terms of the prevalence of parvovirus infection (Cohen and Buckley, 1988; Yamashita *et al.*, 1992). In conclusion, we found that in the majority of cases, infection with parvovirus occurs in the pre-school age period, since 64.8% of 5-7 year-old cases were positive for anti-parvovirus antibody. This result may differ from the findings of many other countries (Anderson *et al.*, 1986; Cohen and Buckley, 1988; Kelly *et al.*, 2000; Yamashita *et al.*, 1992). Despite the high prevalence of parvovirus infection among female individuals, a considerable number of them are still non-infected and are susceptible to this infection in their child-bearing age.

ACKNOWLEDGMENTS

The authors would like to thank Mehdi Kalani, M.Sc. for the statistical analysis. Informed consent was obtained from the study participants. This study was supported by a grant from the Professor Alborzi Clinical Microbiology Research Center, Shiraz University of Medical Sciences (83-13).

REFERENCES

- Anand, A., E.S. Gray, T. Brown, J.P. Clewley and B.J. Cohen, 1987. Human parvovirus infection in pregnancy and hydrops fetalis. *N. Engl. J. Med.*, 316: 183-186.
- Anderson, L.J., C. Tsou, R.A. Parker, T.L. Chorba, H. Wulff, P. Tattersall and P.P. Mortimer, 1986. Detection of antibodies and antigens of human parvovirus B19 by enzyme-linked immunosorbent assay. *J. Clin. Microbiol.*, 24: 522-526.
- Chisaka, H., E. Morita, N. Yaegashi and K. Sugamura, 2003. Parvovirus B19 and the pathogenesis of anaemia. *Rev. Med. Virol.*, 13: 347-359.
- Cohen, B.J. and M.M. Buckley, 1988. The prevalence of antibody to human parvovirus B19 in England and Wales. *J. Med. Microbiol.*, 25: 151-153.
- Cossart, Y.E., A.M. Field, B. Cant and D. Widdows, 1975. Parvovirus-like particles in human sera. *Lancet*, 1: 72-73.
- Heegaard, E.D. and K.E. Brown, 2002. Human parvovirus B19. *Clin. Microbiol. Rev.*, 15: 485-505.
- Kelly, H.A., D. Siebert, R. Hammond, J. Leydon, P. Kiely and W. Maskill, 2000. The age-specific prevalence of human parvovirus immunity in Victoria, Australia compared with other parts of the world. *Epidemiol. Infect.*, 124: 449-457.
- Kyriazopoulou, V., M. Simitsopoulou, J. Bondis, E. Diza, A. Athanasiadis, F. Frantzidou and E. Souliou, 1997. Human parvovirus B19: Immunity of Greek females and prenatal investigation of hydrops fetalis. *Eur. J. Obstet. Gynecol. Reprod. Biol.*, 74: 157-160.
- Lefrere, J.J., A.M. Courouze, Y. Bertrand, R. Girot and J.P. Soulier, 1986. Human parvovirus and aplastic crisis in chronic hemolytic anemias: A study of 24 observations. *Am. J. Hematol.*, 23: 271-275.
- Lin, K.H., S.L. You, C.J. Chen, C.F. Wang, C.S. Yang and S. Yamazaki, 1999. Seroepidemiology of human parvovirus B19 in Taiwan. *J. Med. Virol.*, 57: 169-173.
- Maksheed, M., A.S. Pacsa, S.S. Essa, M.A. Ahmed, R.A. Monem and M. Surkouch, 1999. The prevalence of antibody to human parvovirus B19 in pregnant women in Kuwait. *Acta Trop.*, 73: 225-229.
- Plentz, A., J. Hahn, E. Holler, W. Jilg and S. Modrow, 2004. Long-term parvovirus B19 viraemia associated with pure red cell aplasia after allogeneic bone marrow transplantation. *J. Clin. Virol.*, 31: 16-19.
- Reid, D.M., T.M. Reid, T. Brown, J.A. Rennie and C.J. Eastmond, 1985. Human parvovirus-associated arthritis: A clinical and laboratory description. *Lancet*, 1: 422-425.
- Rodis, J.F., 1999. Parvovirus infection. *Clin. Obstet. Gynecol.*, 42: 107-120.
- Yaegashi, N., T. Niinuma, H. Chisaka, S. Uehara, K. Okamura, O. Shinkawa, A. Tsunoda, S. Moffatt and K. Sugamura, 1999. Serologic study of human parvovirus B19 infection in pregnancy in Japan. *J. Infect.*, 38: 30-35.
- Yamashita, K., Y. Matsunaga, J. Taylor-Wiedeman and S.A. Yamazaki, 1992. Significant age shift of the human parvovirus B19 antibody prevalence among young adults in Japan observed in a decade. *Jap. J. Med. Sci. Biol.*, 45: 49-58.
- Ziyaeyan, M., M. Rasouli and A. Alborzi, 2005. The seroprevalence of parvovirus B19 infection among to-be-married girls, pregnant women and their neonates in Shiraz, Iran. *Jpn. J. Infect. Dis.*, 58: 95-97.