

## Short Communication

# The Seroprevalence of Parvovirus B19 Infection among To-Be-Married Girls, Pregnant Women, and Their Neonates in Shiraz, Iran

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**SUMMARY:** Erythema infectiosum (fifth disease) is the major clinical manifestation of human parvovirus B19 (HPV B19) infection. HPV B19 is known to be associated with adverse effects on fetuses such as hydrops fetalis, aplastic anemia, intrauterine fetal death, and chronic anemia in immunocompromised individuals. The objective of this study was to assess seroprevalence to HPV B19 in three different groups in Shiraz, Iran. The first group included 91 to-be-married girls. The second group included 184 pregnant women and the third group consisted of 184 neonates, who were born to the women in the second group. Specific IgG and IgM antibodies to HPV B19 were measured using ELISA technique. Results showed that the prevalence for IgG to HPV B19 was 56 (61.5%), 127 (69%), and 127 (69%) for the first, second, and third groups, respectively. Overall, 183 out of the 275 (66.5%) women of childbearing age had IgG to HPV B19. The seroprevalence for IgM to HPV B19 was 2.2% for the second group. There was no detectable IgM in umbilical cord sera or in the first group blood samples. In conclusion, approximately one-third of individuals in the study who were of childbearing age were at risk for primary HPV B19 infection.

Human parvovirus B19 (HPV B19) is a DNA virus assigned to the genus *Erythrovirus*, which is the only pathogenic member of the *Parvoviridae* family in humans (1). HPV B19 infection is usually transferred via the respiratory route, but can potentially be transmitted by blood or transfusion of blood components (2). The most common presentation of HPV B19 infection is the childhood disease erythema infectiosum (fifth disease), which results in mild fever and rash (3). In adults, the clinical features vary from asymptomatic or mild to acute illnesses including acute arthritis. Moreover, HPV B19 can lead to aplastic crisis, a life threatening disease in chronic hemolytic anemia patients (4). It causes chronic infection in immunocompromised individuals, which may result in chronic anemia. Primary infection with HPV B19 in pregnant women who do not have antibody to HPV B19 can cause intrauterine fetal involvement or even fetal death (2). Erythrocyte precursor cell infection causes fetal involvement, which leads to fetal anemia. Myocarditis, vasculitis, and liver damage are other complications caused by HPV B19 that lead to fetal death (2). Other consequences of HPV B19 infection include non-immune hydrops fetalis and brain involvement (5).

Seroprevalence of parvovirus B19 is related to age. For example, 2-15% of children below 5 years old, 15-60% of those between age of 5 and 19, and up to 60% of all adults are seropositive (6). More than 90% of the elderly have detectable antibody (7). In one of the studies that was done in the United States on women of childbearing age, the annual seroconversion rate was 1.5% (8).

This study was conducted in three maternity hospitals in Shiraz, Iran. It included three groups as follows. The first

group consisted of 91 to-be-married girls who were referred to public health centers to have pre-marriage tests. The second group consisted of 184 pregnant women who were referred to maternity wards for delivery, and the third group included 184 neonates born to the mothers in the second group. A total of 459 blood samples (each 6-10 ml) were collected between March and November of 2003. The samples were clotted peripheral blood from the individuals in the first group and second group (just before delivery) and umbilical cord blood from the neonates in the third group. Sera were separated, labeled, and kept at  $-20^{\circ}\text{C}$  until tested. To record the patients' data, questionnaires were prepared. Data included the age of individuals in the first and second groups, the newborns' weight, head circumference, and height.

Seroprevalence of IgM and IgG to HPV B19 in each group was determined using indirect antibody capture ELISA kit for IgG detection (Denkaseiken, Tokyo, Japan) and MAC-ELISA for IgM detection (Denkaseiken), respectively. To analyze the data, a Statistical Package for Social Sciences (SPSS) was used. The chi-square was applied to assess the association between categorical variants. A  $P$  value  $<0.05$  was used as the cut-off level for significance.

Among the 184 pregnant women, 127 (61%) were IgG positive and 4 (2.2%) were IgM positive to HPV B19. All neonates from IgG seropositive mothers had detectable IgG to HPV B19. None of them had detectable IgM to HPV B19 in their umbilical cord blood. Among the 91 to-be-married girls, 56 (61.5%) had IgG to HPV B19, and none of them had IgM to HPV B19. In this study, the mean age of the to-be-married girls group was significantly less than that of the pregnant women ( $P < 0.001$ ). The results indicate that the seroprevalence of IgG to HPV B19 in this group of individuals under 19 years old was significantly less than that of the 20 to 30 year-old group of to-be-married girls ( $P = 0.047$ ). However, there was no significant difference between the different age groups (shown in Table 1) of pregnant women. Among the total 275 to-be-married girls of childbearing age

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Table 1. Prevalence of IgG antibody in different age groups of pregnant women and to-be-married girls with child bearing age

Age (years)	Pregnant women		To-be-married girls		Total	
	Positive (%)	Negative (%)	Positive (%)	Negative (%)	Positive (%)	Negative (%)
≤ 19	17 (65)	9 (35)	24 (51)	23 (49)	41 (56)	32 (44)
20-25	62 (68)	29 (32)	26 (72)	10 (28)	88 (69)	39 (31)
26-29	31 (74)	11 (26)	6 (75)	2 (25)	37 (74)	13 (26)
≥ 30	17 (68)	8 (32)	0	0	17 (68)	8 (32)
Total	127 (69)	57 (31)	56 (61)	35 (38)	183 (66)	92 (33)

and pregnant women during labor, 183 (66.5%) had IgG to HPV B19.

A large number of populations are infected with HPV B19 during childhood. However, primary infection with HPV B19 infection in pregnant women might cause fetal damage (9). Depending on gestational age, the complications vary from asymptomatic infections to abortion. Several studies were conducted to determine HPV B19 seroprevalence and evaluate susceptibility of different age groups worldwide. A study that was done on Kuwaiti pregnant women showed that the seroprevalence of IgG and IgM to HPV B19 was 53.3 and 2.2%, respectively (10). In England, Japan, and Spain, the prevalence was 53, 33, and 35%, respectively (7,9,11). The seroprevalence to HPV B19 has varied from 20 to 80% among different age and sex groups in other studies (3,10,12). Results indicate that there is no significant difference between seroprevalence of IgG to HPV B19 among different age groups of pregnant women ( $P = 0.44$ ) (Table 1).

Some studies that covered wider range of age in several age groups indicated that seroprevalence of IgG to HPV B19 is age dependent (10,13,14), though other studies did not prove age dependency (15).

There was a significant statistical difference in seroprevalence of HPV B19 infection between the 19 and under age group and other groups among the to-be-married girls. No such difference was observed among pregnant women in the associated age groups. Although sexual transmission of HPV B19 has not been proved, other activities of married individuals may contribute to this infection. In addition, these women have relatively more contact with children, who naturally show the highest incidence of HPV B19 infection.

All neonates who were born from seropositive mothers had maternal IgG to HPV B19, which seems reasonable and logical. Moreover, no neonate who was born from an IgM-positive mother had IgM. It is notable that the maternal infection might have not been transferred to a woman's own fetus or the amount of immunoglobulin was too slight to be detected even with HPV B19 infection or immune response stimulation by infection. The study showed that approximately one-third of the studied population were susceptible to primary infection with HPV B19 during childbearing age, and infection may have adverse effect on such women's fetuses.

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