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Seropositivity of Epstein-Barr Virus in Eastern Anatolian Region of Turkey

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SUMMARY **In the present study, we have investigated the seropositivity of Epstein-Barr virus (EBV) and the epidemiological factors affecting this seropositivity. A total of 540 subjects living in central Elazig Province and its surroundings were enrolled in the study. IgG antibodies against capsid antigen of EBV (anti-VCA IgG) were determined by ELISA. Seropositivity was found to be 99.4%. There was a significant relationship between increased anti-VCA IgG levels and age, living in crowded families, exposure in public places and low income ($p < 0.05$). However, no significant alterations in serum anti-VCA IgG antibody were observed in terms of gender, blood transfusion and educational status ($p > 0.05$). In conclusion, we have demonstrated the commonly presence of EBV infections in the public and contamination with the infection at early stages of life in the Elazig region. An overpopulated family environment, low income status and living in shared accommodation facilities play important roles in acquiring EBV infection.**

The Epstein-Barr virus (EBV), a human herpes virus (HHV-4) is a DNA virus.[1] The virus enters the host through the oropharynx. Exposure to saliva plays an important role in contamination. The virus tends to invade B lymphocytes, pharyngeal epithelial cells and salivary glands.[1,2] EBV infections usually happen at childhood and remain asymptomatic. However, they may result in serious clinical problems in the presence of immune deficiency and congenital infection.[1] Age, overpopulated family environment, bad hygenic conditions, blood transfusions, organ transfers, sexual contacts and immunologic conditions of the host are important factors at risk in acquiring and developing the infection. In developed countries, particularly in the high socio-economic levels of society, the infection occurs at late childhood and puberty[1,3] while low level socio-economic status societies, it occurs in the early stages of life, usually asymptomatically.[1,4] It is also known that the seroepidemiology of EBV varies among different geographical regions.[1,5] In the present study, we have investigated the EBV seroprevalence and related epidemiological factors which is a province located in the Eastern Anatolian Region of Turkey.

MATERIALS AND METHODS

A total of 540 subjects living in central Elazig and its surroundings were enrolled in the present study. Approval of the Ethics Committee of the Firat University Medical School was obtained prior to commencing the study. Subjects were interviewed, informed about the details of the study and written consent was obtained from each of those who agreed to participate.

Blood samples (5 ml) were collected in standard biochemistry tubes and kept at -20°C until serum was separated. Specific anti-VCA IgG antibodies in serum samples were quantitatively measured by ELISA. Immunowell kits (Genbio, San Diego, USA) were used for the tests in an ELISA reader (Abbott, USA).

Data were statistically analyzed by One-Way ANOVA and post-hoc Tukey B- test using SPSS statistical software for windows (release 10.01).

RESULTS

Of all the subjects, 254 were

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male and 286 female Mean age was 32.4 ± 19.3 years. Distribution of the subjects according to age and gender is shown in Table 1. Mean anti-VCA IgG values for all groups were 2.165 ± 0.657 IU/ml. Anti-VCA IgG values and seropositivity findings according to age groups are presented in Table 2. The serum anti-VCA levels decreased with younger age. Comparing the age groups it was found that the mean anti-VCA IgG values in groups VI and VII were significantly different from the rest ($p < 0.05$), whereas there was no significant variation among the groups I-V ($p > 0.05$).

Table 1 Distribution of age and sex of the subjects in all groups

Groups	Age group (years)	Male (%)	Female (%)	Total (%)
I	0-9	36 (6.6)	46 (8.5)	82 (15.2)
II	10-19	40 (7.4)	41 (7.5)	81 (15.2)
III	20-29	38 (7.0)	45 (8.3)	83 (15.4)
IV	30-39	39 (7.2)	44 (8.1)	83 (15.4)
V	40-49	40 (7.4)	44 (8.1)	84 (15.6)
VI	50-59	43 (7.9)	46 (8.5)	89 (16.5)
VII	≥ 60	18 (3.3)	20 (3.7)	38 (7.0)
Total		254 (47)	286 (53)	540 (100)

Table 2 Mean anti-VCA IgG values and seropositivity in age groups

Group	Anti-VCA IgG		Anti-VCA IgG		Mean anti-VCA IgG values (IU/ml)
	n	% positive	n	% negative	
I	79	96.3	3	3.7	2.218 ± 0.756
II	81	100	0	0	2.304 ± 0.619
III	83	100	0	0	2.181 ± 0. 571
IV	83	100	0	0	2.349 ± 0.581
V	84	100	0	0	2.328 ± 0.541
VI	89	100	0	0	1.881 ± 0.683
VII	38	100	0	0	1.624 ± 0.548
Total	537	99.4	3	0.6	

The subjects were also divided in three groups in terms of family income. Those with a monthly income of < 70 US $ constituted Group I, between 70-350 US $, Group II, and > 350 US$, Group III. Anti-VCA IgG seropositivity and the mean anti-VCA IgG values according to family income are summarized in Table 3. We found significantly higher levels of anti-VCA IgG ($p < 0.0001$) in the low income group.

All subjets were also separated into two groups in terms of living in shared rooms or facilities in any part of their life. Those who never lived in places like day care or dormitories were included in Group I and the others in Group II. Anti-VCA IgG seropositivity and mean values in these groups are presented in Table 4. Serum anti-VCA IgG levels were significantly higher in the subjects who lived in shared accommodation facilities than those who did not ($p < 0.0001$).

The subjects were further divided into two groups in terms of living in crowded families. Those who had 4 or less members in the family constituted Group I and those with 5 members or more in the family, Group II. Distribution of anti-VCA IgG values in terms of this classification is shown in Table

Table 3 Serum anti-VCA IgG levels and its seropositivity in terms of family income

Income profile	Number of people		Anti-VCA IgG (%)		Anti-VCA IgG (IU/ml) (mean value)
	n	%	Positive	Negative	
Group I (low)	127	23.5	100	0	2.513 ± 0.506
Group II (moderate)	233	43.1	99.57	0.4	2.197 ± 0.619
Group III (high)	180	33.3	98.89	1.1	1.876 ± 0.876
Total	540	100	99.4	0.6	

Table 4 Serum anti-VCA IgG levels and seropositivity in terms of living in shared accommodation facilities

Presence in shared public places	Number of people		Anti-VCA IgG (%)		Anti-VCA IgG (IU/ml) (mean value)
	n	%	Positive	Negative	
No (Group I)	276	51.1	99.2	0.72	2.001± 0.704
Yes (Group II)	264	48.9	99.6	0.38	2.337± 0.557
Total	540	100	99.4	0.6	

Table 5 Serum anti-VCA IgG levels and the seropositivity according to the number of people in the family

Group	Number of people		Anti-VCA IgG (%)		Anti-VCA IgG (IU/ml) (mean value)
	n	%	Positive	Negative	
I	263	48.7	99.3	0.7	2.062 ± 0.671
II	277	51.3	99.6	0.3	2.601 ± 0.629
Total	540	100	99.4	0.6	

Table 6 Serum anti-VCA IgG levels and seropositivity according to sex

Gender	Number of people		Anti-VCA IgG (%)		Anti-VCA IgG (IU/ml) (mean value)
	n	%	Positive	Negative	
Group I (male)	254	47	99.6	0.4	2.140 ± 0.666
Group II (female)	286	53	99.3	0.7	2.187 ± 0.649
Total	540	100	99.4	0.6	

Table 7 Serum anti-VCA IgG levels and the seropositivity according to educational status

Educational status	No. of people		anti-VCA IgG (%)		Anti-VCA IgG (IU/ml) (mean value)
	n	%	Positive	Negative	
Uneducated (Group I)	150	27,8	98	2	2.170 ± 0.717
Primary school only (Group II)	188	34,8	100	0	2.191 ± 0.656
High school (Group III)	152	28,1	100	0	2.150 ± 0.614
Higher education (Group IV)	50	9,3	100	0	2.100 ± 0.619
Total	540	100	99.4	0.6	

5. The values of those living in a crowded family environment were found to be significantly higher ($p < 0.0001$). The mean anti-VCA IgG levels and their distribution in different sexes are summarized in Table 6. We have found no significant difference in anti-VCA IgG values between males and females ($p > 0.05$).

All subjects were stratified into four groups in consideration of their educational status. The groups were as follows: no school education in Group I; primary school education only in Group II, high school graduates in Group III and university graduates in Group IV. The distribution of anti-VCA IgG values according to educational status is shown in Table 7. No statistically significant differences were found among all four groups.

DISCUSSION

In EBV infections, anti-VCA IgG antibodies are formed a short while after contamination with the infectious agent, they reach a peak two to three months thereafter and then decline but they remain in detectable levels throughout the whole life. Determination of anti-VCA IgG is commonly applied in seroepidemiological studies.[5] ELISA technique provides the most specific and selective detection of these antibodies.[1] Therefore, in the present study we have employed this method for investigating anti-VCA IgG levels.

Although exposure age to EBV infection varies among different societies and countries, percentage of seroprevalence is about 95% in adults irrespective of countries.[6-10] It appears from several investigations that seroprevalence usually increases with age.[11] However, a study carried out in the Bari region of Italy has shown that seroprevalence ratios for various age groups are 83.6% in 0-6 months, 65.6% in 6-12 months, 40.3% in 1-2 years, 80.2% in 2-7 years and 81.9% in 8-10 years.[12] In some other studies examining seroprevalence levels in people living in western Turkey, the EBV seropositivity has varied between 76.1 and 87.8% among different age groups.[13,14] In the present study, the seropositivity was found to be 99.44%. It was 96.35% in the 0-9 years age group. Our results suggest that EBV seropositivity is high in the eastern part of Turkey and the people get infected with EBV early in life.

Socioeconomical status is believed to affect contamination with EBV infection, and the infection is usually gained at early ages in low income socioeconomic societies.[3,15] Similarly, prevalence of infection has been reported to be high in individuals living in overpopulated public places and families, and such people also acquire the infection at a young age.[1,16,17] Our study showed that there is a significant correlation between increased anti-VCA IgG levels and older age, crowded family environment and living in places like day care and dormitories. We have also shown that anti-VCA IgG levels were elevated in low income families. There was no significant difference in seropositivity in terms of blood transfusion, gender and educational status.

EBV is a relatively low contagious infection and epidemics are not seen; however, the virus continuously circulates in the society.[1,5] Findings that high anti-VCA IgG levels in people living in overpopulated places and/or families suggest that such people are exposed to the virus more frequently. It is also thought that individuals with low income probably live in crowded families with which elevated levels of anti-VCA IgG are associated. Similarly, lack of effect on sex, educational status and blood transfusion reinforces the importance of exposure in overpopulated environments. Parallel increases in age and anti-VCA IgG levels may be accounted for contamination at early stages and repeated exposure at later stages of life.

In conclusion, we have shown that EBV infections are common in the studied society and contamination occurs at early stages of life in Elazig province. In the region, crowded family environment, living in shared accommodation facilities and low economic status play important roles in acquiring EBV infection. We suggest that elder age, overpopulated family, sharing public places and low socioeconomic status are among the factors that determine blood levels of anti-VCA IgG antibodies.

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