
SHORT PAPER

Hepatitis A antibody prevalence among young adults in Israel – the decline continues

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SUMMARY

This study sought to determine whether the decline in prevalence of hepatitis A virus (HAV) antibodies detected in Israel in 1977, 1984, and 1987 has continued. The anti-HAV antibody prevalence of a systematic sample of 578 male and female recruits inducted into the Israel Defence Force in 1996 was 38·4%. The reduction in antibody prevalence from 1977 (64%) was highly significant ($P < 0\cdot001$). There was a smaller decrease rate in recruits of European, North American, Australian and South African origin than from elsewhere. A 'strategy' that uses active immunization against hepatitis A (inactivated vaccine, instead of gamma globulin) should be considered, particularly in high risk groups such as field units during military service.

Hepatitis A is endemic in Israel with annual reported rates ranging from 0·5–1·6 cases/1000 population [1, 2]. A decrease in the incidence is apparent during the last 12 years [2]. The annual incidence of clinically-identified viral hepatitis in the Israel Defense Forces (IDF) has dropped from an average of 6/1000 troops in the 1960s to 2·5/1000 in the 1970s [3], and to an average of 0·5 cases/1000 troops in the last decade. The decrease in morbidity rates has been attributed mainly to the use of immune serum globulin (ISG) in selected groups during summer and fall as a pre-exposure prophylaxis, and to all potential contacts of an ill person [3, 4]. This approach could be hampered by worldwide shortage of ISG and a slight risk of transferring pathogens by intramuscular injection of ISG [5].

Concurrently with the decrease in incidence, a significant reduction along the years was observed in hepatitis A virus (HAV) antibody prevalence among military recruits: 64% in 1977, 54% in 1984 and 45·5% in 1987 [6–8]. The lowering of natural

immunity against the illness presents a significant problem for the military.

In previous studies, strong ethnic differences in the prevalence of anti-HAV antibodies have been described, with persons of Asian and African origin having a much higher prevalence of anti-HAV than those of European and North American extraction. Similar results have been observed in the United States and other countries [9, 10].

The aim of our study was to measure the anti-HAV antibody prevalence among military recruits of 1996, who represent a cross section of the young adult population in Israel, and to compare these findings with previous observations from studies of identical design.

A representative sample of male and female recruits was drawn, collecting sera of 578 conscripts who joined the army between 1 August 1995 through 31 July 1996. The sample included 333 male and 245 female recruits, producing a close representation of the usual 3:2 male to female ratio in the IDF. The sample size allowed us to identify 10% absolute change in prevalence from previously reported 1977,

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Table 1. Trends in anti-HAV antibody prevalence: total and distribution by ethnic origin and gender among young Israeli adults, 1977-96

	1977		1984*		1987		1996		χ^2 for trend	<i>P</i> for trend
	No.	Positive (%)	No.	Positive (%)	No.	Positive (%)	No.	Positive (%)		
Origin										
East	674	83.1	218	71.1	256	57	274	50.4	117.4	< 0.0001
West	430	35.6	143	28	201	30.8	273	26.4	6.63	0.01
Israel	42	50	22	54.5	26	50	31	38.7	0.85	0.36
Gender										
Male	751	68.7	383	54	277	49.8	333	41.4	78.5	< 0.0001
Female	396	55.1	*	*	206	40.3	245	34.3	28.6	< 0.0001
Total	1147	64	383	54	483	45.8	578	38.4	110.9	< 0.0001

* Only male recruits were included in the survey of 1984. Not included in total trend analysis.

1984 and 1987 samples with a 2-tailed α value of 0.05 and a power exceeding 80%.

Induction into military duty is compulsory in Israel both for men and women at the age of 18 years. About 30% of women are exempt from service, mainly due to religious reasons. Among men, about 90% are recruited. Therefore, the study sample is more representative of the total male population with a possible selection bias among the females. Country of origin was defined by the father's birthplace (or where this was Israel, the paternal grandfather's birthplace). Europe (excluding Turkey), the Americas, Australia and South Africa were defined as West. All other birthplaces, except Israel, were classified as East. Sera were stored at -20°C . The anti-HAV antibody studies were performed at the central IDF laboratories by means of solid phase radioimmunoassay (HAVAB-Abbott Laboratories, N. Chicago, IL).

Statistical analysis included two-tailed Fisher's test for anti-HAV prevalence rate differences between strata and chi-square test for trend between succeeding examinations along the years. Multiple logistic regression was used to control for potential confounding. All tests were performed using the PEPI statistical software [11]. The antibody testing performed among recruits of 1984 included males only. Therefore this result was exempt from the total analysis, and included only when data were stratified by gender.

The anti-HAV antibody prevalence was 38.4% (95% CI, 34.4-42.5%) among the recruits of 1996. This compared to 45.8% (95% CI, 41.2-50.3%) in 1987 and 64% (95%, 61.2-66.7%) in 1977. The overall decrease trend along the years was highly significant (Table 1). The mean age of the recruits in

the sample was 18.7 years (s.d. = 0.96), similar to previous studies in the IDF. The prevalence of anti-HAV was higher among male than female recruits ($P = 0.08$) and higher in conscripts of Eastern than of Western origin ($P < 0.0001$). The decrease trend was highly significant when stratified by gender or by ethnicity. When stratified by gender and ethnicity, the decrease trend remained highly significant in both males and females of Eastern origin, but disappeared in Westerners. The prevalence rate was invariably higher among male than among female recruits. A significant difference in anti-HAV prevalence was found between recruits with 12 (high school) or more years of schooling (37.2% positive) compared with less than 12 years (46.2% positive; $P = 0.0072$). Ethnic origin, educational level and gender were included in the multivariate analysis. The strongest independent correlate of the anti-HAV presence was ethnic origin ($P = 0.001$). Education level and gender were not significantly associated with anti-HAV prevalence ($P = 0.074$ and $P = 0.33$ respectively), when adjusted for ethnicity.

The results of this study point to a relatively low level of natural protection against hepatitis A among young people before they join the army. Over 60% of recruits will start their service lacking immunity against the virus, allowing high morbidity rates and occurrence of outbreaks. The prevalence of anti-HAV is determined by pathogen's endemicity in the region, and personal factors such as exposure to siblings and other possible virus carriers, personal hygiene, family lifestyle and nutritional habits. Many of these factors differ when compared between clusters defined by ethnicity, even though the vast majority of young adults included in the study were Israeli born. We

believe that ethnic origin, and to a lesser extent, educational level, can serve as a proxy for most of these personal influences. A lower prevalence of anti-HAV in soldiers of European than in Asian or North-African origin is possibly a result of Easterners being more heavily exposed during childhood, thus leaving a lower percentage to encounter the virus for the first time whilst in service. Although there are possible genetic influences, they are probably minor and a much larger study group is necessary to evaluate their impact on the seroepidemiology of hepatitis A. The rate of decrease is higher in recruits of Eastern origin, both male and female. In recruits of Western origin the decrease disappears when stratified by gender, possibly as a result of a small sample size. The differences in the decrease rates between strata can be a result of a higher starting point for persons of Eastern origin, since as the next age groups are raised in better hygiene and healthier environment, their exposure diminishes. Another interpretation is possible; that at the current level of endemicity of hepatitis A in Israel, there exists a certain minimal level of exposure, reflected by the small decrease in the Western subgroup who have possibly already reached this minimum.

An important comment, discussed in previous studies [6, 9, 12], is that the decrease results mainly from a cohort effect, since most, if not all the exposure occurs at the 'great equalizer' level of the kindergarten with a low subsequent chance of encountering the pathogen and therefore, no significant changes in anti-HAV prevalence.

We have shown that the prevalence rate of anti-HAV has decreased during the last 20 years and it will probably continue to decline, unless there will be a major national immunization effort against the disease. These findings suggest a reduction in faeco-oral transmission of HAV infection in childhood in Israel, although considerable ethnic differences still exist. The reduced prior exposure to the virus among young adults poses a problem of increasing proportion of susceptibles; a condition common to many developed countries and is particularly threatening in high risk circumstances. Consequently, larger number of

soldiers are at risk for acquisition of HAV infection during their service, especially in high risk conditions such as field units.

In addition to reflecting a change in exposure to a feco-oral infection, seroprevalence data may be useful in planning and assessing hepatitis A prevention and intervention policy in the military as well as the civilian sectors. Combined with the problems of ISG availability and enhanced severity of the disease in adults, the results point in favour of advancing toward active immunization with hepatitis A vaccines as the major prophylactic measure against the disease.

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