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SHORT COMMUNICATION

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Seroprevalence of hepatitis A markers in subjects exposed to biological risk

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Abstract ***Objectives:*** The seroprevalence of hepatitis A virus antibodies was investigated in a population of 1051 subjects, of whom 376 were controls and 675 were exposed to different degrees of biological risk. ***Methods:*** The exposed group was subdivided into subjects at low (242), intermediate (265), and high (168) biological hazard; all subjects were employed in the biomedical field. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels were also determined. ***Results:*** The seroprevalence of positive hepatitis A antibodies was 44.9% in all subjects but was significantly higher in males (50.6%) than in females (34.2%) and increased according to age (25.9% in subjects aged ≤40 years and 62.2% in subjects aged >40 years). No difference related to exposure to the biological risk was observed. The prevalence of transaminases at levels above normal values ($\chi^2 = 4.079$, $P < 0.05$ for AST and $\chi^2 = 4.806$, $P < 0.05$ for ALT) and mean values (AST $P < 0.05$; ALT $P < 0.001$) appeared significant in hepatitis A virus-positive subjects. On the other hand, excluding individuals with positive hepatitis C virus antibodies (16) and positive hepatitis B virus surface antigen (12), a prevalence of transaminase alterations was not observed, but mean levels of ALT lasted significantly longer in subjects with positive hepatitis A virus antibodies ($P < 0.01$). ***Conclusions:*** The results confirm that hepatitis A virus is not a risk for employees in the biomedical field, but the presence of hepatitis A virus antibodies suggests a possible, though not clinically evident, liver involvement.

Key words Hepatitis A markers · Biological risk
Liver involvement

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Introduction

Discovery of positive hepatitis A (HAV) markers in the general population is frequent, even in the absence of anamnestic HAV infection. On the other hand, the seroprevalence of positive HAV markers in people is closely related to their age (Frösner et al. 1979). HAV infection plays a pivotal role in the epidemiology of viral hepatitis and is endemic in several countries. Usually the infection is related to ingestion of food and water contaminated by fecal material of infected subjects.

Occupational exposure to biological materials is one of the possible hazards of HAV infection; onset of the disease was observed in subjects employed in a wastewater treatment plant (De Serres and Laliberté 1997), though no significant seroprevalence was shown in sewer workers (De Serres et al. 1995) or hospital workers (Djeriri et al. 1996). In contrast, Skinhøj et al. (1981) showed a significant seroprevalence of HAV antibodies in sewer workers; the seroprevalence was correlated with age rather than with the duration of exposure.

The aim of the present research was to study the seroprevalence of HAV markers in a population exposed to biological risk during work in different exposure situations at the University of Padua.

Subjects and methods

Study design

A total of 1051 subjects (675 exposed individuals and 376 controls) employed at Padua University were investigated for their immunological status with regard to HAV antibodies. The subjects were subdivided according to sex (688 males and 363 females), age (≤40 or >40 years), and risk group. Four risk groups were established as follows. Risk group 0 (R0), considered as the control, comprised subjects employed in laboratories without exposure to biological materials and included chemists, physicists, agronomists, mineralogists, and geologists. Risk group 1 (R1) consisted of subjects exposed to low and occasional biological risk and included biologists, biochemists, and pharmacists. Risk group 2 (R2) comprised subjects exposed to intermediate, continuous biological risk, such as

pharmacologists and physicians. Risk group 3 (R3) consisted of subjects exposed to high biological risk, such as surgeons, specialists in obstetrics and midwives, microbiologists, pathologists, and personnel employed in the preparation of histology slides.

All personnel had been subjected to a complete anamnesis, clinical examination, and determination of HAV (IgG and IgM) antibodies by an enzyme immunoassay (EIA) method (Sorin, Saluggia, TO, Italy) in addition to assay of serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) by means of a commercial kit (Boehringer, Mannheim, Germany). All individuals had been subjected to health surveillance in compliance with Italian legislative decree 626/94. All data reported are anonymous according to Italian privacy law 675/96.

Statistical analysis

The prevalence of positive HAV antibodies and transaminases exceeding normal values (AST >45 U/l, ALT >55 U/l) was studied by means of χ^2 with Yates correction, and differences in transaminase activity were studied using Student's *t*-test; significance was set at $P < 0.05$.

Results

The seroprevalence of positive HAV antibodies in all subjects was 44.9%. Higher seroprevalence was observed in males (50.6%) as opposed to females (34.2%) and in older (62.2%) versus younger subjects (25.9%). No difference among the risk groups was found. HAV infection was remembered as a clinical manifestation by only 8.5% of the subjects with positive HAV antibodies. Age appeared to be the most relevant cause of positive HAV antibodies ($\chi^2 = 137.665$, $P < 0.001$), with a higher prevalence being observed in males ($\chi^2 = 114.283$, $P < 0.01$) than in females ($\chi^2 = 14.076$, $P < 0.001$). In addition, males showed a higher seroprevalence of positive HAV antibodies than did females ($\chi^2 = 25.241$, $P < 0.001$), but only in the age class of >40 years ($\chi^2 = 17.451$, $P < 0.001$). Table 1 summarizes the seroprevalence of positive HAV antibodies in the study population.

Table 2 shows the mean (± SEM) values recorded for AST and ALT and the percentage of prevalence of transaminase values above the normal limits. Males showed significant higher AST and ALT values than did females ($P < 0.001$). Age is another factor influencing transaminase activities, because subjects aged ≤40 years showed AST and ALT activities significantly lower than those of subjects aged >40 years ($P < 0.05$ and $P < 0.001$, respectively). On the other hand, no prevalence of abnormal values was observed between the age groups. The prevalence of transaminase values above the normal limit appeared to be significant in terms of positive HAV antibodies for AST ($\chi^2 = 4.079$, $P < 0.05$) and ALT ($\chi^2 = 4.806$, $P < 0.05$). In addition, mean values of transaminases were significantly

Table 1 Age of subjects (mean ± SEM) and seroprevalence of positive HAV antibodies in the study population (*Risk 0* No exposure, *Risk 1* low and occasional exposure, *Risk 2* intermediate but continuous exposure, *Risk 3* high exposure to biological risk)

	Age (years)	% HAV+	% HAV+		% HAV+	
	Mean ± SEM	Total	≤40 years	>40 years	M	F
Total	42.5 ± 0.3	44.9				
Males	44.5 ± 0.4	50.6	25.3	67.2		
Females	38.3 ± 0.5	34.2	26.8	46.7		
Risk 0	43.9 ± 0.6	47.9	23.4	67.5	48.9	41.2
Risk 1	43.1 ± 0.7	43.8	28.3	57.4	50.8	35.7
Risk 2	40.5 ± 0.6	41.5	28.6	54.5	49.3	31.3
Risk 3	40.9 ± 0.9	45.2	23.9	68.8	54.2	41.1
≤40 years		25.9				
>40 years		62.2				

Table 2 Transaminase behavior (mean ± SEM) and prevalence of values above the normal limit (AST > 45 U/l, ALT >55 U/l) as determined among subjects exposed or not exposed to biological risk[a]

	AST (U/l) Mean ± SEM	Prevalence %	ALT (U/l) Mean ± SEM	Prevalence %
Total	27.8 ± 0.3	3.3	27.3 ± 0.6	4.9
Males	29.3 ± 0.4	3.8	31.3 ± 0.9	6.3
Females	25.1 ± 0.6*[1]	1.9	19.8 ± 0.6*[1]	2.2*[1]
Risk 0	28.8 ± 0.5	3.2	28.1 ± 1.3	4.8
Risk 1	27.2 ± 1.0	3.7	28.5 ± 1.3	5.8
Risk 2	26.9 ± 0.6	2.6	27.2 ± 1.0	6.0
Risk 3	27.4 ± 0.7	3.0	24.2 ± 1.0	1.8
≤ 40 years	27.0 ± 0.4	2.0	24.7 ± 0.6	3.8
>40 years	28.4 ± 0.5*[2]	4.2	29.8 ± 1.0*[3]	5.8
HAV −	27.0 ± 0.4	2.1	25.2 ± 0.6	3.6
HAV +	28.6 ± 0.6*[4]	4.7*[4]	29.9 ± 1.2*[5]	7.0*[4]

*[1] $P < 0.001$ for males vs females; *[2] $P < 0.05$; *[3] $P < 0.001$ for >40 vs ≤40 years in relation to class of age; *[4] $P < 0.05$; *[5] $P < 0.001$ HAV+ vs HAV −

[a] For definitions of risk, see Table 1

higher in positive subjects ($P < 0.05$ and $P < 0.001$, respectively), but only in the oldest ones. No correlation among transaminases and potus was observed.

Discussion

Data obtained on the seroprevalence of positive HAV markers in 1051 subjects, 675 of whom were exposed to different degrees of biological risk, confirm that HAV infection is not a risk factor in workers employed in the biomedical field, according to Djeriri et al. (1996). In addition, the seroprevalence of positive HAV antibodies was confirmed to increase with age (Frösner et al. 1979). The difference between males and females also appears to be significant (males show a higher seroprevalence than do females), but only in older subjects (> 40 years). This appears difficult to explain but suggests the necessity to prevent the risk for the disease in the general population by means of vaccination therapy during youth, according to other authors (Dubois et al. 1992). Indeed, after 40 years of age the probability of HAV infection is 2.4 times higher in males and 1.7 times greater in females. This appears relevant because the data clearly show that only the oldest group of subjects with positive HAV markers display a significant increase in mean ALT values.

In addition, the same subjects showed a significant prevalence of AST and ALT levels above the normal values, though transaminase values appeared higher in males than in females and increased significantly with age. On the other hand, 16 subjects (13 HAV-positive and 3 HAV-negative individuals) were HCV-positive and 12 (9 HAV-positive and 3 HAV-negative individuals) were HBV surface-antigen-positive. Excluding these subjects, the prevalence of transaminases above normal limits did not appear to be significant; on the contrary, mean ALT values lasted significantly longer ($P < 0.01$) in HAV-positive subjects. Furthermore, these subjects displayed no excessive ethanol consumption or clinical evidence of liver disease.

In conclusion, the results obtained on the seroprevalence of positive HAV markers suggest that (1) HAV is not a risk in workers employed in the biomedical field; (2) positive HAV markers are correlated with a slight but significant increase in transaminases, suggesting a possible, though not clinically evident, liver involvement; and (3) vaccination therapy during youth should prevent possible liver damage caused by HAV infection.

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