Antibodies to hepatitis A antigen in relation to the number of lifetime sexual partners in patients attending an STD clinic

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SUMMARY Samples of serum from 421 patients attending a clinic for sexually transmitted diseases (STDs) were tested by radioimmunoassay for determination of the prevalence of antibodies to hepatitis A antigen (anti-HA). It was found that 42·4% of 33 homosexual men, 39·4% of 218 heterosexual men, and 38·8% of 170 female patients had positive results for anti-HA. The association between serological results and data on STD patients, using the variables of age, sexual type and preference, number of sexual partners in the preceding six months, and number of lifetime sexual partners and age, was determined statistically. The results show that the number of lifetime sexual partners is another factor concerned in the high prevalence of anti-HA.

Introduction

Since the recent identification of hepatitis A virus¹⁻³ and the development of a sensitive and specific assay procedure to detect its antibody (anti-HA),^{1,4-6} several workers have studied the epidemiological pattern of infection with this virus. The data indicate that infections are widespread throughout the world and that the prevalence of anti-HA is related to geographical location, age, and socioeconomic factors but not to sex.⁷⁻¹¹

We have identified patients attending a clinic for sexually transmitted diseases (STDs) as another group of people with a high prevalence of anti-HA.¹¹ To determine whether the number of sexual partners might account for this high prevalence, we have tested for anti-HA a further group of male and female STD patients (including homosexuals), who were asked about numbers of sexual partners.

While this study was in progress, Corey and Holmes¹² reported data on heterosexual and homosexual men attending a clinic for STDs in Seattle, Washington, USA. They showed an increased incidence of anti-HA in homosexual men and concluded that hepatitis A should be considered

as one of the enteric infections that appear to be sexually transmitted among homosexuals. But they did not study the relationship of the number of sexual partners to the acquisition of anti-HA nor did they study women.

Patients and methods

STUDY POPULATION

During the period April 1977 to November 1978, 716 patients were seen at the clinic for sexually transmitted diseases, Victoria General Hospital, Halifax, Nova Scotia, Canada; 421 of these patients (aged between 17 and 35 years) were included in the study. The reasons for excluding 295 patients were: (a) no sera were collected from 70 patients; (b) 91 men were not asked about sexual preference or number of sexual partners; (c) 41 refused to answer questions about the number of sexual partners; (d) information about sexual preference was not recorded in 54 men; and (e) 39 were over 35 years of age.

Our control group of 293 volunteer Red Cross blood donors and 151 student nurses has been described.¹¹

STATISTICAL ANALYSES

Statistical analyses were carried out on the results from 421 patients for whom data had been obtained on age, number of sexual partners in the preceding

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six months, number of lifetime sexual partners, and, if male, whether he had had homosexual contacts.

The presence or absence of anti-HA was determined for each patient and controls.

RADIOIMMUNOASSAY

All sera were assayed by the radioimmunoassay specific for antibodies to hepatitis A (HAVAB) developed by Abbott Laboratories, North Chicago, Illinois, USA. The HAVAB test is based on the principle of competitive binding of anti-HA in serum and radioactively labelled anti-HA (^{125}I anti-HA) to hepatitis A virus-coated beads. If there is any anti-HA present in the serum, less (^{125}I) anti-HA will be bound to the beads.

Results

The prevalence of anti-HA in 421 patients was compared with data from two other groups from the same geographical area.¹¹ The number of patients tested and the percentages positive for groups matched for age are given in table I. χ^2 tests on 2×2 contingency tables indicated highly significant differences between STD clinic patients and the two control groups (volunteer blood donors and student nurses).

The basic data for the STD patients, including the overall prevalence rates for anti-HA in the three groups of patients tested, are given in table II.

STATISTICAL ANALYSIS

Statistical tests for association between serological test results and data on STD patients used the variables in the following format: serological test result (positive, negative); age group (15-19, 20-24, 25-29, 30-35 years); sex or sexual preference (female, heterosexual male, homosexual male); number of sexual partners in the preceding six months (0, 1, 2, 3-5, 6-8, 9-150); and number of lifetime sexual partners (0-1, 2-5, 6-10, 11-20, 21-40, 41-950). Single-variable analyses of anti-HA test results were carried out for each of the "predictor" variables individually using contingency table χ^2 statistics and ordered $2 \times c$ analysis statistics¹³ for variables with a natural ordering such as age groups and numbers of sexual partners.

The results of these statistical tests indicated that the presence of anti-HA was not significantly associated between men and women ($P=0.98$) or between homosexual and heterosexual men ($P=0.89$) nor with the number of sexual partners in the preceding six months ($P=0.06$); however, the association with the number of lifetime sexual partners ($P<0.0001$) and with age ($P<0.0001$) was highly significant.

Because there is less statistical evidence for the association of the number of sexual partners in the preceding six months with the presence of anti-HA than there is with the number of lifetime partners, further analysis used only the number of lifetime sexual partners as an indicator of sexual activity. As

TABLE I Prevalence of anti-HA in STD clinic patients compared with Red Cross blood donors and student nurses in comparable age groups

Group	Sex	Age (years)		No tested	% Anti-HA-positive
		Range	Mean		
Blood donors	M	18-26	20.9	140	11.4
STD clinic patients	M	18-26	22.9	189*	36.5†
Blood donors	F	18-26	21.1	153	13.7
STD clinic patients	F	18-26	22.0	127†	34.6†
Student nurses	F	18-24	19.3	151	13.2
STD clinic patients	F	18-24	21.3	105	34.3†

*All men aged 18-26 years (including 22 homosexuals).

†Of these 127, 105 are included in the patients compared with student nurses below.

‡Significant at $P=0.001$.

TABLE II Summary of basic data on STD patient groups

Sexual type	No of sexual partners		Age (years)		No tested	% Anti-HA-positive
	Range	Mean $\pm$ SD	Range	Mean		
Homosexual	2-500	57.6 $\pm$ 96.8	21-35	26.5	33	42.4
Heterosexual						
Men	0-950	33.8 $\pm$ 79.5	17-35	25.2	218	39.4
Women	0-150	9.9 $\pm$ 14.8	17-34	23.6	170	38.8
Total	0-950	26.0 $\pm$ 65.5	17-35	24.7	421	39.4

SD = standard deviation

it is possible that the highly significant association of anti-HA with the number of lifetime partners and age are dependent on one another, further analysis was carried out to investigate this.

A multivariate discriminant analysis was performed using age, sex (including sexual preference in men), and number of lifetime sexual partners as discriminating variables for the presence of anti-HA. Results of a step-wise analysis, carried out on the combined data with all 421 STD patients included in a single analysis, are shown in table III. An F-test was used to determine the level of significance of the contribution of each successive addition to the discrimination equation. As table III shows, the ordering of the "predictor" variables according to their relative contributions was: number of lifetime sexual partners, age, and sexual preference (in that order). The contributions of the first two were statistically significant at the conventional level ($P=0.05$) whereas that of the third was not, although its small P value suggested that it may be a factor.

Discussion

We have previously reported¹¹ that both male (43.4%) and female (45.8%) patients at an STD clinic have a higher prevalence of anti-HA than control populations of volunteer blood donors (12.6%) and student nurses (13.8%) from the same geographical area and of the same age group. In the present study we have confirmed (using a further group of patients) that both male and female patients attending an STD clinic have a high prevalence of anti-HA.

The only other study of STD patients is the recent report by Corey and Holmes,¹² which reports only on men. Their prevalence rate for heterosexual men attending an STD clinic was only 12%, which is similar to that of our control group of volunteer blood donors and student nurses. This large difference between our prevalence rate in heterosexual men (39.4%) attending an STD clinic

and theirs (12%) may be due to regional variations in prevalence rates or related to the fact that all their heterosexual men were being followed for herpes genitalis. (Did this condition make them likely to have fewer partners?)

We found that 42.4% of our homosexual men (mean age 26.5 years) had antibodies to hepatitis A antigen, whereas Corey and Holmes initially found a prevalence of 30% in homosexuals with a mean age of 31.2 years.¹² In contrast to their findings we found no significant difference between heterosexual and homosexual men with respect to the prevalence of anti-HA.

Other groups have commented on the possible association between the prevalence of anti-HA and sexual activity. Szmunn *et al*¹⁴ reported that homosexual men had the same prevalence of anti-HA as middle class men in New York City. Frosner *et al*¹⁷ reported that 185 German prostitutes had no significant variation in prevalence of anti-HA when compared to an age-controlled group of accident patients. However, Mathiesen *et al*¹⁵ reported that homosexual men were overrepresented in the male population admitted to hospital with acute viral hepatitis of either type A or type B in Copenhagen, Denmark.

Szmunn *et al*¹⁰ reported that various factors are concerned in the spread of hepatitis A virus, some of which have been identified—for example, geographical location, age and socioeconomic factors—and some of which are as yet unknown. The importance of our study of STD patients is that we have reported a highly significant association between the number of sexual partners and the prevalence of anti-HA, which appears to be independent of sex and age. This association with the number of sexual partners may be one of the unknown factors in the spread of hepatitis A virus.

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TABLE III Discriminant analysis for the presence of anti-HA in STD patients

Variables	Means	SD	F (to enter or remove)	Significance
X ₁ (No of sexual partners)	3.423*	1.473	15.309	0.000
X ₂ (age)	24.682	4.088	4.471	0.031
X ₃ (sexual type)	2.33†	0.614	2.789	0.087

Discriminant equation: $0.86 \left(\frac{X_1 - m_1}{s_1} \right) + 0.52 \left(\frac{X_2 - m_2}{s_2} \right) + 0.40 \left(\frac{X_3 - m_3}{s_3} \right)$
 with (+ / -) group centroids: 0.2890 and -0.1881

*Mean based on grouped data coded as follows: 0 and 1 coded 1, 2–5 coded 2, 6–10 coded 3, 11–20 coded 4, 21–40 coded 5, 41–950 coded 6.

†Mean based on codes: homosexual men coded 1, heterosexual men coded 2, women coded 3.

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