

Hepatitis B antigen and antibody in the blood of prostitutes visiting an outpatient venereology department in Rotterdam

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SUMMARY We took blood samples from 128 prostitutes visiting the outpatient venereology department of the University Hospital, Rotterdam-Dijkzigt to test for the presence of hepatitis B surface antigen (HBsAg) and antibody to hepatitis B surface antigen (anti-HBs). The prevalence of anti-HBs was found to be significantly higher in the group of prostitutes than in "normal populations", and we concluded that more of the former had been in contact with the hepatitis B virus (HBV). We recommend that the advice on vaccination of the hepatitis B committee of the Health Council of The Netherlands should be followed by screening prostitutes for the presence of HBsAg and anti-HBs in the blood, and vaccinating those who have no anti-HBs.

Introduction

Various authors have pointed to the link between promiscuity, homosexuality, drug use, and the carrier state for hepatitis B surface antigen (HBsAg) or antibody (anti-HBs).¹⁻⁷ As HBsAg is found in the body fluids and in secretions, its sexual transmission seems possible and even probable. Saliva is the secretion most often named as a transmitter of HBsAg.⁸⁻¹⁰ Although transmission of hepatitis B virus (HBV) by the oral route has been shown by Krugman *et al.*,¹¹ the results of the study by Bodansky appear to contradict this.¹² Research into the occurrence of HBsAg and anti-HBs has been carried out on, among others, male homosexuals and promiscuous women, particularly prostitutes.¹³⁻¹⁶ As a result we undertook a study on the occurrence of HBsAg and anti-HBs in the blood of prostitutes who visited the outpatient venereology department of the University Hospital, Rotterdam-Dijkzigt, and compared the results with data from previously published studies.

Patients and methods

PATIENTS

In the period from 1 January to 1 July 1982 we took blood samples to test for the presence of HBsAg and

anti-HBs from 128 prostitutes who visited this hospital's outpatient venereology department. Blood samples that gave positive results for HBsAg were also screened for the presence of hepatitis Be antigen (HBeAg) and antibody to hepatitis Be antigen (anti-HBe).

LABORATORY STUDIES

We used a radioimmunoassay to show HBsAg and HBeAg, and the Australia antigen Surface antibody (Au Sab) test (Abbott Laboratories, North Chicago, Illinois, United States of America) to show anti-HBs and anti-HBe. We recorded the age and nationality of each woman. Where the results were positive for HBsAg, anti-HBs, or both we asked the patient about previous liver disease, and whether she had been jaundiced at any time.

The results obtained were compared with data on the prevalence of HBsAg in female Dutch blood donors of comparable ages in Rotterdam, which were supplied by the head of the Rotterdam Blood Transfusion Service, Dr F C Kothe. We also compared our results with the prevalence of HBsAg and anti-HBs in some "normal populations" in Europe and Canada as reported by Sobeslavsky.¹⁷

STATISTICAL ANALYSIS

In the statistical evaluation of our results the age dependence of prevalences was determined using the trend test for percentage frequencies.²¹ To judge the reliability of observed prevalences in the different categories we calculated the corresponding 95% con-

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Accepted for publication 27 October 1983

confidence intervals.²¹ Differences in prevalences were evaluated with the Fisher test, or the χ^2 approach for this test.²¹

Results

Table I gives the age distribution of the 128 prostitutes divided into Dutch and foreign nationality.

Three (2.3%) of the 128 samples gave positive results for HBsAg and negative results for HBeAg; two of them had HBs. Two of the patients from whom these samples had been taken were aged 23, and the third was aged 29, and they were all Dutch. None of them had clinical evidence of hepatitis. Of the 128 samples, 42 contained anti-HBs; 31 of these samples were from Dutch and 11 from foreign prostitutes. None of these women remembered having had clinical evidence of hepatitis.

TABLE I Age distribution of 128 Dutch and foreign prostitutes in five year groups

Age group	Dutch	Foreign	Total
50-54	1		1
45-49	3		3
40-44	7	1	8
35-39	10	2	12
30-34	21	7	28
25-29	25	12	37
20-24	28	7	35
15-19	3	1	4
Total	98	30	128

Table II shows the nationalities of the 30 foreign prostitutes, and the occurrence of anti-HBs among them.

Table III shows the prevalence of HBsAg, anti-HBs, or both in Dutch and foreign prostitutes related to age. In the group of all 45 prostitutes who gave positive results for HBsAg, anti-HBs, or both no significant trend of prevalence with age was found (trend tests, $p > 0.05$). The same applies to the groups of Dutch and foreign prostitutes considered separately. There was no significant difference (χ^2 test, $p > 0.05$) between Dutch and foreign prostitutes with HBsAg, anti-HBs, or both. In the total of 128 it can

TABLE II Nationalities of 30 foreign prostitutes and prevalence of anti-HBs

Country of origin	Occurrence of anti-HBs	Total
Surinam	4	6
Morocco	2	2
Tunisia	1	1
Germany	1	3
England	1	3
Spain	1	2
Philippines	1	1
Portugal		2
Brazil		1
Indonesia		1
France		3
Sweden		2
Cabo Verde		2
Belgium		1
Total	11	30

be concluded that, with a confidence coefficient of 0.95, between 0.5% and 6.7% serum samples should be positive for HBsAg and between 25% and 42% should be positive for anti-HBs.

Table IV shows the prevalence of HBsAg and that of anti-HBs in Dutch and foreign prostitutes. In view of the overlapping of the corresponding confidence intervals, there was no significant difference ($p > 0.05$) between Dutch and foreign prostitutes with HBsAg or anti-HBs.

In a total of 936 new female blood donors who registered at the Red Cross Laboratory in Rotterdam in the first half of 1982, serum from two (0.2%) contained HBsAg. In these 936 women it can be con-

TABLE III Prevalence of HBsAg, anti-HBs, or both among Dutch and foreign prostitutes related to age

Age group*	No positive/No tested		
	Dutch	Foreign	Total (%)
50-54	4/11	0/1	4/12 (33)
35-39	1/10	1/2	2/12 (17)
30-34	8/21	2/7	10/28 (36)
25-29	10/25	4/12	14/37 (37)
15-24	11/31	4/8	15/39 (38)
Total	34/98	11/30	45/128 (35)

*Arranged so that there were at least 12 in each group.

TABLE IV Prevalence of HBsAg and anti-HBs in Dutch and foreign prostitutes

Nationality	HBsAg		Anti-HBs	
	No positive/ No tested (%)	95% confidence interval	No positive/ No tested (%)	95% confidence interval
Dutch	3/98 (3.1)	0.16-8.7%	31/98 (32)	23-42%
Foreign	0/30 (0)	0-11.6%	11/30 (37)	20-56%
Total	3/128 (2.3)	0.5-6.7%	42/128 (33)	25-42%

cluded that, with a confidence coefficient of 0.95, between 0.02% and 0.7% women should be HBsAg positive. The prevalence (3.1%) of HBsAg in the group of Dutch prostitutes studied did not differ significantly (χ^2 test, $p > 0.05$) from the above prevalence (0.2%) in blood donors.

Table V shows the prevalence of HBsAg and anti-HBs found by Sobeslavsky¹⁷ in "normal populations" of men and women in Ottawa (Canada), Berlin (East Germany), Göttingen (West Germany), and Munich (West Germany). From this table it can be seen that, in view of the overlapping of the 95% confidence intervals, the differences between the prevalences of HBsAg in the four cities were not significant. The prevalence of anti-HBs in Berlin was considerably greater than in the other cities, in each of which it was about 4%. The prevalence of HBsAg in our patients (table IV) did not differ appreciably from that given in table V, whereas the prevalence of anti-HBs in our study (table IV) was considerably greater than that given in table V.

Discussion

None of our patients with HBsAg had clinical symptoms of hepatitis. The patients most likely to transmit HBV are those with HBeAg, whereas those with HBsAg and anti-HBe are unlikely to transmit the infection by sexual contact.²² As the blood of two of our patients with HBsAg was positive for anti-HBe, they were unlikely to transmit the infection by sexual contact. Moreover, none of the 42 patients with anti-HBs was aware of ever having suffered from hepatitis B. Especially in the case of the foreign prostitutes, however, one possibility is that an HBV infection was acquired in childhood, as occurs in a number of subtropical and tropical countries. It is notable that all three patients with HBsAg were Dutch. A striking feature among the foreign prostitutes was the relatively large number of Surinamese women who had anti-HBs (four of the total of 11 women with anti-HBs, and four of the six

Surinamese women) (table II). In contrast to the results of Frösner *et al*,¹⁶ we were unable to show a noticeable correlation of prevalence with age (table III).

We have no satisfactory explanation for the fact that there was no appreciable difference in the prevalence of HBsAg, anti-HBs, or both between Dutch and foreign prostitutes (table III). It is not impossible that foreign, in particular Surinamese, prostitutes had already come into contact with HBV in childhood, while Dutch prostitutes come into contact with hepatitis B virus only later, during sexual activity. The number of years of prostitution and the type of prostitution (for example, heroin prostitution) are probably important factors regarding contact with HBV.

There are widely differing reports of the prevalence of HBsAg and anti-HBs. Adam *et al* found no appreciable differences between prostitutes, nuns, female residents in certain homes, and a control group in prevalence of HBsAg and anti-HBs.¹³ Similarly, Papaevangelou *et al* found no appreciable differences in prevalence of HBsAg between 293 prostitutes and 379 pregnant women of the same age and social class; the prevalence was 4.4% and 3.4% respectively. The prevalence of anti-HBs in the first group (56.7%), however, was significantly higher than that in the second group (24.5%).^{14, 15} Frösner *et al* studied the prevalence of anti-HBs in populations with different levels of promiscuity.¹⁶ They found 31% in 258 prostitutes, 10% in 258 female blood donors, 10% in 48 nuns in a convent, and 15% in 94 nuns working in education. In each group the prevalence of anti-HBs increased with age. In the age group 40-49 years, for example, 72% of the prostitutes and 23% of the blood donors had anti-HBs.

The prevalence of HBsAg found in our study in Dutch prostitutes (table IV) was not appreciably higher than in the female Dutch blood donors of comparable ages in Rotterdam. The prevalence of anti-HBs in the group of prostitutes studied by us

TABLE V Prevalence of HBsAg and anti-HBs in some "normal populations" of men and women in Ottawa, Berlin, Göttingen, and Munich¹⁷

City	HBsAg		Anti-HBs	
	No positive/ No tested (%)	95% confidence interval	No positive/ No tested (%)	95% confidence interval
Ottawa	7/1177 (0.6)	0.3-1.3%	52/1217 (4.3)	3.2-5.6%
Berlin	7/438 (1.6)	0.6-3.3%	43/311 (13.8)	10.2-18.2%
Göttingen	0/159 (0)	0.2-3.0%	7/159 (4.4)	1.8-8.9%
Munich	22/1799 (1.2)	0.8-1.9%	67/1799 (3.7)	2.9-4.7%
Total*	29/3135 (0.9)	0.6-1.3%	126/3175 (4.0)	3.3-4.7%

*Excluding Berlin.

was significantly higher than that found in "normal populations" in Ottawa, Berlin, Göttingen, and Munich (see tables IV and V). From these results we conclude that prostitutes have a greater chance of coming into contact with HBV than people in control groups. In view of their sexual behaviour, they also have more opportunity to spread HBsAg. Although we do not know the date of acquisition of HBV by prostitutes, we subscribe to the view of the hepatitis B committee of the Health Council that prostitutes belong to groups of healthy people who, because of exceptional circumstances, are continuously or incidentally exposed to HBV infection.¹⁸ It seems desirable that the regular sexual partners of prostitutes should also be classed in these groups, partly on the basis of the findings of Grady¹⁹ and Inaba *et al.*²⁰

We advocate following the interim vaccination advice of the hepatitis B committee that, partly to prevent the transmission of HBV to clients, prostitutes who have not yet been infected with HBV should be given the opportunity to have themselves vaccinated against this viral infection. This requires regular screening of prostitutes for anti-HBs and HBsAg.

References

- Bleeker A, Coutinho RA, Bakker-Kok J, Tio D, de Koning GAJ. Prevalence of syphilis and hepatitis B among homosexual men in two saunas in Amsterdam. *Br J Vener Dis* 1981; **57**:196-9.
- Lim KS, Taam Wong V, Fulford KWM, *et al.* Role of sexual and non-sexual practices in the transmission of hepatitis B. *Br J Vener Dis* 1977; **53**:190-2.
- Coleman JC, Waugh M, Dayton R. Hepatitis B antigen and antibody in a male homosexual population. *Br J Vener Dis* 1977; **53**:132-4.
- Coutinho RA, Schut BJT, Albrecht-van Lent N, Reering-Brongers EE. Hepatitis B among homosexual men in the Netherlands. *Sex Transm Dis* 1981; **8**:333-5.
- William DC. Hepatitis and other sexually transmitted diseases in gay men and in lesbians. *Sex Transm Dis* 1981; **8**:330-2.
- Szmunes W, Much MI, Prince AM, *et al.* On the role of sexual behaviour in the spread of hepatitis B infections. *Ann Int Med* 1975; **83**:489-95.
- van Beek-Verbeek G. Het voorkomen van hepatitis B-antigeen en -antistoffen in het bloed van verslaafden aan drugs. *Ned Tijdschr Geneeskd* 1979; **23**:1144-7.
- Heathcote J, Cameron CH, Dane DS. Hepatitis B antigen in saliva and semen. *Lancet* 1974; **i**:71-3.
- Villarejos VM, Visona PHKA, Alvaro Gutierrez D, Antonio Rodriguez A. Role of saliva, urine and feces in the transmission of type B hepatitis. *N Engl J Med* 1974; **292**:1375-8.
- Ward R, Borchert P, Wright A, Kline E. Hepatitis B antigen in saliva and mouth washings. *Lancet* 1972; **ii**:726-9.
- Krugman S, Giles JP, Hammond J. Infectious hepatitis. *JAMA* 1967; **200**:365-73.
- Bodansky HJ. Lack of transmission of viral hepatitis type B after oral exposure to HBsAg positive saliva. *Br Med J* 1979; **ii**:1263-4.
- Adam E, Blaine Hollinger F, Melnick JL, Dueñas A, Rawls WE. Type B hepatitis antigen and antibody among prostitutes and nuns. A study of possible venereal transmission. *J Infect Dis* 1974; **129**:317-21.
- Papaevangelou G, Trichopoulos D, Kremastinou T, Papoutsahis G. Prevalence of hepatitis B antigen and antibody in prostitutes. *Br Med J* 1974; **ii**:256-8.
- Papaevangelou G, Trichopoulos D, Papoutsahis G, Kremastinou T, Pavlides E. Hepatitis B antigen in prostitutes. *Br J Vener Dis* 1974; **50**:228-31.
- Frösner GG, Buchholz HM, Gerth HJ. Prevalence of hepatitis B antibody in prostitutes. *Am J Epidemiol* 1975; **102**:241-50.
- Sobeslavsky O. Prevalence of markers of hepatitis B virus infection in various countries: a WHO collaborative study. *Bull WHO* 1980; **58**:621-8.
- Van der Heide J. Vaccinatie tegen hepatitis B: een interim advies van de Gezondheidsraad. *Ned Tijdschr Geneeskd* 1982; **126**:1556-7.
- Grady GF. Strategies for prevention of hepatitis B as a sexually transmitted disease. *Sex Transm Dis* 1981; **8**:344-8.
- Inaba N, Ohkawa R, Matsuura A, Kudoh J, Takamizawa H. Sexual transmission of hepatitis B surface antigen. Infection of husbands by HBsAg carrier-state wives. *Br J Vener Dis* 1979; **55**:366-8.
- Fleiss JL. *Statistical methods for rates and proportions*. New York: Wiley, 1981.
- Pastore G, Denticio P, Angarano G, Lapedota E, Schiraldi O. Infectivity markers in HBsAg carriers and intrafamilial spread of hepatitis B virus infection. *Hepato-Gastroenterol* 1981; **28**:20-2.