

Prevalence and risk factors of hepatitis B in Spanish prostitutes

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SUMMARY

Eighty prostitutes were tested by solid-phase radioimmunoassay for serum markers of hepatitis B virus (HBV). Of 8 (10%) with hepatitis B surface antigen (HBsAg), 6 (75%) also had hepatitis Be antigen (HBeAg). Antibodies to HBsAg (anti-HBs) and to hepatitis B core antigen (anti-HBc) were found in 52 (65%). Antibodies to HBeAg (anti-HBe) were positive in 32 (40%). Anti-HBc alone was found in 5 (6%) and anti-HBs alone in 2 (2%). Sixty-seven (84%) were positive for at least one HBV marker and 13 (16%) were still susceptible to infection. Hepatitis B markers were more prevalent in prostitutes than in the normal Spanish population. Age, a history of sexually transmitted diseases (STD), drug abuse and promiscuity are factors which were highly related to hepatitis B markers. We concluded that screening prostitutes for the presence of markers and vaccinating those who are negative would be worth while.

INTRODUCTION

High levels of efficacy and safety of hepatitis B vaccine have been demonstrated in well-designed controlled clinical trials among high-risk populations (Szmunn *et al.* 1980, 1981). Nevertheless, the high cost of this vaccine forces us to choose the candidates for this vaccination very carefully. Logically, the vaccination should only be given to those who are susceptible. Therefore, in high risk groups, prior screening for serum markers followed by vaccination only of those who are negative is the lowest-cost strategy because it allows important savings in the number of doses of vaccine (Mulley, Silverstein & Dienstag, 1982).

Several epidemiological studies have demonstrated high rates in the prevalence of serum markers of HBV among heterosexual patients attending STD clinics (Jeffries *et al.* 1973; Fulford *et al.* 1973), prostitutes (Papaevangelou *et al.* 1974;

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Frosner, Buchholtz & Gerth, 1975; Hoop *et al.* 1984) and male homosexuals (Szmunnec *et al.* 1975; Schreeder *et al.* 1982).

To calculate prevalence of HBV infection in prostitutes and to formulate indications for the use of hepatitis B vaccine, we have tested for serum markers of HBV in prostitutes attending an STD clinic in Madrid. In addition we included, within an epidemiological questionnaire which the prostitutes answered voluntarily, several questions on sexual behaviour and other risk factors for HBV infection. We also compared our results with data from previously published studies in prostitutes and with the prevalence reported in the normal Spanish population (Vargas *et al.* 1982).

MATERIALS AND METHODS

To test for the presence of HBsAg, anti-HBs, HBeAg, anti-HBe and anti-HBc, we took blood sample from 80 prostitutes attending the Martínez-Anido Clinic, an STD clinic in Madrid.

In this study we have included only the serum samples from prostitutes who answered voluntarily all the following questions: age, history of STD, number of sexual partners in the last month, number of sexual partners in the last year, history of hepatitis or previous liver disease and parenteral exposure (blood transfusion and intravenous drug addiction). They were assured that all personal information would be kept confidential and we noted details of STD or the reason for consultation.

We collected 10 ml of blood from each prostitute and the serum samples were stored at -70°C prior to testing for serum markers of HBV in batches.

We used solid-phase radioimmunoassays (RIA) as commercial kits made by Abbott Laboratories (AUSRIA-II, AUSAB, Abbott-HBe and CORAB). The sera which were positive for HBsAg were sent to Dr A. M. Couroucé of the Blood Transfusion Centre of Paris, who had kindly agreed to subtype the surface antigen by an electroimmunodiffusion technique.

In accordance with currently accepted criteria (Deinhardt, 1982), we have assumed that prostitutes with positive results for anti-HBc and anti-HBs had overcome the infection and had developed immunity. Serum samples positive only for anti-HBs could be either immune patients or those with cross-reacting antibody (false positive) (Werner *et al.* 1985). A positive test for anti-HBc only can indicate either the 'window period' or long-past infection. Therefore those positive 'only for anti-HBs' and 'only for anti-HBc' are two serological patterns which are difficult to interpret especially when their level is unknown. We have listed these two patterns separately and we draw no conclusions about active or past infection based on these results. Nevertheless, because we have used a very specific and sensitive method of testing (RIA) and these serum samples were positive in two different assays, we have considered these results to be genuinely positive and we have included them in the 'any positive marker' group. We considered that any serum marker positive for HBV meant previous contact with the virus and was included as an epidemiological marker. We also assumed that all prostitutes with negative screening tests for serum markers would be susceptible to infection and, therefore, candidates for vaccination.

Table 1. Prevalence of serum markers of HBV in prostitutes

	<i>n</i>	%
Positive for HBsAg	8	10
Positive for anti-HBs, anti-HBe and anti-HBc	32	40
Positive for anti-HBs and anti-HBc	52	65
Positive for anti-HBc alone	5	6
Positive for anti-HBs alone	2	2
Any positive marker	67	84

Table 2. Serologic patterns in prostitutes positive for HBsAg

Case	Age	STD	HBsAg	HBsAg subtypes	Anti-HBs	HBeAg	Anti-HBe	Anti-HBc
1	25	Multiple STD	+	Not typed	—	+	—	+
2	26	Multiple STD	+	<i>ayw2</i>	—	—	—	—
3	31	Secondary syphilis	+	Not typed	—	+	—	—
4	36	NGU	+	Not typed	—	—	—	+
5	29	Primary syphilis	+	<i>adw2</i>	—	+	—	—
6	28	Primary syphilis	+	<i>adw2</i>	—	+	—	—
7	39	NGU	+	<i>adw2</i>	—	+	—	+
8	26	Multiple STD	+	Not typed	—	+	—	+

Table 3. Epidemiological characteristics of the prostitutes in the study

Reasons for consultation	<i>n</i>	(%)	Age	<i>n</i>	(%)	Number of sexual partners	<i>n</i>	(%)
Syphilis	8	(10)	17-45 years	80	(100)	(a) In the last month		
SMPS*	33	(41)	17-20 years	10	(13)	1-5	9	(11)
Trichomoniasis	9	(11)	21-25 years	19	(23)	6-30	57	(71)
Candidiasis	5	(6)	26-30 years	19	(23)	More than 30	14	(18)
NGU†	7	(9)	31-35 years	20	(25)	(b) In the last year		
Gonorrhoea	4	(5)	More than 35 years	12	(15)	1-20	5	(6)
Multiple STD	14	(17)				21-50	9	(11)
						51-100	23	(29)
						101-300	25	(31)
						More than 300	18	(23)
History of STD								
Yes	22	(28)						
No	58	(72)						
Drug abuse								
Yes	7	(9)						
No	73	(91)						
Blood transfusion								
Yes	0	(0)						
No	80	(100)						
Previous hepatitis								
Yes	8	(10)						
No	72	(90)						

* SMPS: Serological monitoring of previous syphilis.

† NGU: non-gonococcal urethritis.

RESULTS

Table 1 shows the prevalence of HBV markers in prostitutes. Eight (10%) prostitutes were positive for HBsAg, 52 (65%) were immune against HBV and 13 (16%) were susceptible. The combined prevalence, a measure of past and current hepatitis B by any positive marker, was 67 (84%).

Table 2 shows further details of the 8 prostitutes positive for HBsAg. Of these 6 (75%) were also positive for HBeAg and 4 (50%) were positive for anti-HBc. Anti-HBe antibodies were not detected in any of their sera. Patient no. 2 was positive only for HBsAg. The HBsAg subtype could be determined only in 4 cases (one 'ayw2' and three 'adw2'). The other 4 cases had very low levels of HBsAg which could not be subtyped.

Table 3 summarizes the epidemiological details of the subjects. Thirty-three prostitutes (41%) attended the clinic for serological monitoring of previous syphilis and 47 (59%) had different types of STD at the time the specimens of blood were collected. Their ages ranged between 17 and 45 years. Twenty-two prostitutes (28%) had a history of past STD, 7 (9%) of drug abuse, 8 (10%) had had hepatitis but none of the participants in this study had had a blood transfusion.

Tables 4-8 compare the prevalence of HBV markers with type of STD, with age, with a past history of STD, with drug abuse, and with promiscuity, respectively.

DISCUSSION

Comparing our results with the normal population in Spain (Vargas *et al.* 1982), we found a greater prevalence of all serum markers of HBV among prostitutes: HBsAg: 10% vs 1.8%; past infection: 65% vs 15% and any positive marker: 84% vs 24.4%. Despite the average age of these two groups being not strictly comparable, and the fact that our laboratory tests were more sensitive (RIA vs passive haemagglutination), it is reasonable to conclude that the prostitutes should be considered to be a high-risk group for acquiring infection with HBV.

An important finding among those positive for HBsAg was the high rate of HBeAg positivity. These data indicate that prostitutes positive for HBsAg are highly infectious (Shikata, Karasawa & Abe, 1977). Three prostitutes positive for both HBsAg and HBeAg but with no anti-HBc and one prostitute with HBsAg as the only positive marker were thought to be late in the incubation period or in the very early stages of an acute infection. Follow-up of these patients confirmed this opinion because other serum markers for HBV appeared later.

When the HBV markers were compared with type of STD, the patients with syphilis, non-gonococcal urethritis (NGU) and multiple STD showed a higher frequency of HBsAg positives than the other types of STD. Syphilis can be thought of as a systemic disease with early liver damage (Feher *et al.* 1975) and with some suppression of cellular immunity (Baker-Zander, Sell & Lukerhart, 1982). Although both these factors can increase the risk for HBV infection in patients with syphilis, we do not have an explanation for the high prevalence in patients with NGU and with multiple STDs. On the other hand, whereas some have found a higher prevalence among STD patients with a history of syphilis

Table 4. Prevalence of HBV markers by type of STD

STD	n	HBsAg- Positive	Past infection	Isolated anti- HBc-positive	Isolated anti- HBs-positive	Any positive marker
		n (%)	n (%)			n (%)
Syphilis	8	3 (37)	4 (50)	0	0	7 (87)
SMPS*	33	0 (0)	25 (75)	4	1	30 (90)
Trichomoniasis	9	0 (0)	6 (66)	1	1	8 (88)
Candidiasis	5	0 (0)	3 (60)	0	0	3 (60)
NGU†	7	2 (28)	3 (42)	0	0	5 (71)
Gonorrhoea	4	0 (0)	2 (50)	0	0	2 (50)
Multiple STD	14	3 (21)	9 (64)	0	0	12 (85)
Total	80	8 (10)	52 (65)	5 (6)	2 (2)	67 (84)

* Serological monitoring of previous syphilis.

† Non-gonococcal urethritis.

Table 5. Prevalence of HBV markers by age

Range of age	n	HBsAg- Positive	Past infection	Isolated anti- HBc-positive	Isolated anti- HBs-positive	Any positive marker
		n (%)	n (%)			n (%)
17-20 years	10	3 (30)	4 (40)	0	0	7 (70)
21-25 years	19	3 (15)	10 (50)	1	0	14 (73)
26-30 years	19	2 (10)	11 (57)	2	1	16 (84)
31-35 years	20	0 (0)	17 (85)	1	1	19 (85)
More than 35 years	12	0 (0)	10 (83)	1	0	11 (91)
Total	80	8 (10)	52 (65)	5 (6)	2 (2)	67 (84)

Table 6. Prevalence of HBV markers by STD history

STD history	n	HBsAg- Positive	Past infection	Isolated anti- HBc-positive	Isolated anti- HBs-positive	Any positive marker
		n (%)	n (%)			n (%)
Yes	58	7 (12)	40 (60)	5	2	54 (93)
No	22	1 (4)	12 (54)	0	0	13 (59)
Total	80	8 (10)	52 (65)	5 (6)	2 (2)	67 (84)

(Kruger *et al.* 1982; Lacey, Meaden & Clarke, 1983; Coester *et al.* 1984), others have reported a higher prevalence only in patients with a history of STD in general (Frosner *et al.* 1975; Hoop *et al.* 1984; Szmunness *et al.* 1975; Kacaki *et al.* 1975; Lim *et al.* 1977; Schneider *et al.* 1977). This apparent disparity is possibly due to some of these studies including only serological tests for syphilis in the STD screening, and no other STD was investigated. We believe that the association between hepatitis B and one type or another of STD is casual.

As was to be expected, the proportion of cases with any marker for HBV increased with age due to their persistence after initial infection, confirmed by the majority of serum samples positive for HBsAg being found in the younger prostitutes. If the age of starting prostitution is similar in all prostitutes, this trend towards a decrease in the prevalence of HBsAg positivity and an increase in

Table 7. *Prevalence of HBV markers by history of drug abuse*

Drug abuse history	<i>n</i>	HBsAg-Positive <i>n</i> (%)	Past infection <i>n</i> (%)	Isolated anti-HBc-positive	Isolated anti-HBs-positive	Any positive marker <i>n</i> (%)
Yes	7	2 (28)	4 (57)	1	0	7 (100)
No	73	6 (8)	48 (65)	4	2	60 (82)
Total	80	8 (10)	52 (65)	5 (6)	2 (2)	67 (84)

Table 8. *Prevalence of HBV markers by promiscuity*

Number of sexual partners	<i>n</i>	HBsAg-Positive <i>n</i> (%)	Past infection <i>n</i> (%)	Isolated anti-HBc-positive	Isolated anti-HBs-positive	Any positive marker <i>n</i> (%)
In the last month						
1-5	9	0 (0)	5 (55)	1	0	6 (66)
6-30	57	5 (9)	37 (64)	4	2	48 (84)
More than 30	14	3 (21)	10 (71)	0	0	13 (92)
Total	80	8 (10)	52 (65)	5 (6)	2 (2)	67 (84)
In the last year						
1-20	5	0 (0)	3 (60)	0	0	3 (60)
21-50	9	0 (0)	6 (66)	1	0	7 (77)
51-100	23	2 (8)	14 (60)	2	1	19 (82)
101-300	25	3 (12)	16 (64)	2	1	22 (88)
More than 300	18	3 (16)	13 (72)	0	0	16 (88)
Total	80	8 (10)	52 (65)	5 (6)	2 (2)	67 (84)

the markers of past infection with age is consistent with sexual transmission of HBV.

Other risk factors seem to be a history of STD and of intravenous drug addiction. The higher frequency of HBV markers in prostitutes with a history of STD is also consistent with promiscuity, because the risk of STD is proportional to promiscuity. Drug abuse is a well-known risk factor for parenteral acquisition of hepatitis B. It has been suggested (Dietzman *et al.* 1977) that the *ay* subtype of HBsAg is preponderant in serum samples from patients with acute hepatitis B who admitted self-injection of drugs, whereas the *ad* subtype was preponderant in patients without a history of parenteral exposure. In our study, three cases were positive for *adw2* and one for *ayw2*. Unfortunately the other four positive HBsAg sera could not be subtyped and no conclusions could be drawn.

There was a strong relationship between promiscuity and markers for HBV, either HBsAg or others indicating past infection. There is also a relationship between HBV infection and promiscuity both in the last month and in the last year. Therefore if promiscuity carries a higher risk of contracting STD, hepatitis B is no exception. Nevertheless 12% of the prostitutes in the group of higher promiscuity had no HBV marker. These susceptible prostitutes, except in promiscuity, were epidemiologically similar to the other prostitutes.

A comparison with other similar studies (Table 9) is necessary considering that the patterns of HBV infection vary in different countries and that laboratory techniques vary in sensitivity.

As in other epidemiological studies, many of these HBV infections are

Table 9. *Epidemiological studies by HBV markers in prostitutes*

Reference	Country	Percentage with				
		HBsAg	Anti-HBs	HBeAg	Anti-HBe	Anti-HBc
Frosner <i>et al.</i> (1975)	German Federal Republic	2.3 (PHA)*	31 (PHA)	—	—	—
Papaevangelou <i>et al.</i> (1974)	Greece	4.4 (CIP)	56.7 (PHA)	—	—	—
Kaklamani <i>et al.</i> (1980)	Greece	11 (RIA)	60 (RIA)	—	—	60 (RIA)
Adam <i>et al.</i> (1979)	Colombia	5 (RIA)	20 (PHA)	—	—	—
Goh <i>et al.</i> (1985)	Singapore	6 (RIA)	64 (RIA)	27 (RIA)†	—	63 (RIA)
Hoop <i>et al.</i> (1984)	Netherlands	2.3 (RIA)	23 (RIA)	—	—	—
Present study	Spain	10 (RIA)	65 (RIA)	75 (RIA)†	40 (RIA)	71 (RIA)

* Laboratory technique used: (PHA), passive haemagglutination; (CIP), counterimmuno-electrophoresis; (RIA), radioimmunoassay.

† Only in serum samples positive for HBsAg.

subclinical, with only 10% of the prostitutes giving a history of hepatitis, and this increases the risk of spread of infection. Therefore, it is likely that prostitutes play a role in the spread of hepatitis B in urban populations, and we consider that a considerable economic saving could be made by offering vaccination against hepatitis B to prostitutes. This would decrease expenditure on treatment in the acute stage of infection and on the long-term sequelae (chronic carriers, chronic persistent and active hepatitis, cirrhosis and hepatocarcinoma). It would also be a very good prophylactic measure in the prevention of sexual transmission of hepatitis B.

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