HEPATITIS B ANTIGEN IN A DIALYSIS UNIT: FIVE YEARS EXPERIENCE

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INTRODUCTION

Viral Hepatitis remains a serious complication in most hemodialysis units causing morbidity and death among patients and staff members. Mortality rate was 6.9% in European centres and it ranged from 6 — 28% in centres in various countries, Gurland. This study is an attempt to assess the magnitude of the problem occurring in this part of the world where statistics on the incidence of hepatitis in dialysis units are scanty. The study does not include non-B hepatitis.

MATERIAL AND METHOD

From May 1972 to June 1977, 1138 blood tests for Hepatitis B antigen (HBs Ag) and Hepatitis B antibody (anti-HBs) were carried out by the Counter-Immuno-Electrophoresis (CIE) method. The subjects include 98 patients and 78 staff members who were considered to have been exposed to the hepatitis B virus during that period. Screening for Hepatitis B infection was performed on all patients and staff upon entry to the unit as a routine. All those who were found to have positive HBs Ag or anti-HBs were excluded from the unit. In the patients the tests were repated at 3 monthly intervals and for staff at 6 monthly intervals. If found to be positive the tests were repeated more frequently.

Of the 98 patients, 69 were from the centre dialysis unit, 11 from the self dependency dialysis unit, and 18 were on home dialysis. Patients at the centre dialysis unit were initially on the Standard Kiil dialyser and were dialysed 2 x 15 hours per week but from September 1975 the dialysis frequency was increased to 3 x a week on Meltec Multipoint (3 x 8 hours) and Cordis Mark IV (3 x 6 hours) dialysers.

The period of exposure was considered as the period of time that the patient was on dialysis at the centre dialysis unit. Once the patient is transferred to the self-dependency dialysis unit, or home dialysis or receives a renal allograft he is for the purpose of this study considered not to be exposed. The source of infection is presumed to be in the centre dialysis unit. The period of exposure for staff members was considered as the period while they were attached to the centre dialysis unit.

RESULTS

Of the 98 patients, 77 (78.57%) were males and 21 (21.43%) were females; and of the 78 staff members, 13 (16.66%) were males and 65 (83.34%) were females. The mean duration of exposure for male

patients was 23.89 + 20.89 months; and for female patients was 19.66 ± 21.73 months (difference not significant); for male staff was 27.3 ± 15.10 months, and for female staff was 26.90 ± 18.97 months, as shown in Table I.

TABLE I

DISTRIBUTION OF PATIENTS AND STAFF AND THEIR MEAN DURATION OF EXPOSURE (MONTHS) TO HEPATITIS FROM MAY 1972 TO JUNE 1977

	Patient		Staff	
	Male	Female	Male	Female
Number	77	21	13	65
Percentage	78.57%	21.43%	16.66%	83.34%
Total	98(100%)		78(100%)	
Duration of Exposure (Months)	23.89 ± 20.89	19.66 ± 21.73	27.38 ± 15.10	26.90 ± 18.97

INCIDENCE

The overall incidence of HBs Ag and anti-HBs for patients is 28.5% (28/98) and for staff is 10.2% (8/78) (Table II). There is a higher incidence of HBs Ag than anti-HBs. Among the 17 HBs Ag positive patients, 19.4% (15/77) were male and 9.5% (2/21) were female. Of the 11 anti-HBs positive patients, 12.9% (10/77) were male and 4.7% (1/21) were female. Among the 8 staff affected, 1 male and 4 females had HBs Ag+ and 1 male and 2 females had anti-HBs+.

DURATION OF EXPOSURE

The female staff positive for HBs Ag had the longest duration of exposure, (Table III), 55.75 ± 29.6 months. The same is true for female staff with anti-HBs+, 45.0 ± 44.66 months. Male patients with anti-HBs+ on the other hand had the longest duration of exposure, 44.6 ± 19.75 months.

Table IV shows the duration of exposure in months prior to patients or staff becoming HBs Ag or anti-HBs positive. The mean duration of exposure before infection for patient was 12.98 ± 8.2 months and for staff 12.87 ± 14.9 months. There was no difference in the period of exposure between patients and staff. One patient received a renal allograft but subsequently had a rejection and was put back on centre dialysis after graft nephrectomy. He was found to be HBs Ag + four months after his return to centre dialysis.

TABLE II

INCIDENCE OF HEPATITIS B ANTIGEN (HBs Ag) AND HEPATITIS B ANTIBODY (ANTI-HBs) IN PATIENTS AND STAFF

	Patient		Staff	
	Male	Female	Male	Female
HBs Ag Anti-HBs	(15/77) 19.4% (10/77) 12.9%	(2/21) 9.5% (1/21) 4.7%	(1/13) 7.6% (1/13) 7.6%	(4/65) 6.1% (2/65) 3.0%
Total: HBs Ag + Anti-HBs	(25/77) 32.3%	(3/21) 14.2%	(2/13) 15.2%	(6/65) 9.1%
TOTAL = M + F	(28/98) 28.5%		(8/78) 10.2%	

TABLE III

MEAN DURATION OF EXPOSURE IN MONTHS OF PATIENTS AND STAFF POSITIVE FOR HBs Ag OR ANTI-HBs

	Patient		Staff	
	Male	Female	Male	Female
HBs Ag	20.0 ± 17.0	26.0 ± 28.28	11.0	55.75 ± 29.26
Anti-HBs	44.6 ± 19.75	35.0	36.0	45.0 ± 46.66

TABLE IV

MEAN DURATION OF EXPOSURE IN MONTHS BEFORE PATIENTS AND STAFF BECAME POSITIVE FOR HBs Ag OR ANTI-HBs

	Patients		Staff	
	Male	Female	Male	Female
HBs Ag	12.82 ± 11.33	1.5 ± 0.7	1.0	32.0 ± 14.76
Anti-HBs	17.62 ± 21.19	20.0	1.0	17.5 ± 19.09
Both	12.98 + 8.2		12.87 + 14.9	

MORBIDITY

None of the infected staff members developed clinical hepatitis. 13 out of the 28 (46%) patients infected had either clinical or biochemical evidence of hepatitis. 8 had HBs Ag and 5 had anti-HBs. The mean serum bilirubin was 1.7 ± 0.43 mg%, SGPT was 186 ± 122 I.U. and hepatomegaly ranged from ½ cm to 5 cm below the right costal margin. All these patients had mild illness not requiring hospitalization. Of these 13 patients, 6 became negative for HBs Ag and anti-HBs, 3 are still HBs Ag+, and 4 others have died from other causes before the serum became antigen or antibody negative.

Table V summarizes the mean duration for sero-conversion in patients and staff. All the staff became negative for HBs Ag and anti-HBs by 7 months.

PERSISTENCE

25% (7/28) of patients had persistent HBs Ag and 3.5% (1/28) had persistent anti-HBs. The duration of persistence of either HBs Ag was 20.0+10.2 months for males and 16.0 ± 16.9 months for females. None of the staff had persistence of either HBs Ag or anti-HBs. Table VI shows the duration of persistence.

2 patients and 1 staff were positive for anti-HBs but subsequently became negative after 4, 4, and 7 months respectively. After an interval of 24, 17, and 13 months respectively they became positive for HBs Ag but in all 3 the HBs Ag disappeared by 6 months and none had clinical hepatitis.

TABLE V

MEAN DURATION FOR SERO CONVERSION IN HBs Ag OR ANTI-HBs POSITIVE INDIVIDUALS (MONTHS)

	Patient		Staff	
	Male	Female	Male	Female
HBs Ag n = number	4.5 ± 2.34 n = 6	0	6.0 n = 1	5.8 ± 3.7 n = 4
Anti-HBs n = number	8 ± 4.18 n = 9	0	7.0 n = 1	6.5 ± 0.7 n = 2
Total	n = 15	0	n = 2	n = 6

TABLE VI

MEAN DURATION OF PERSISTENCE FOR HBs Ag OR ANTI-HBs SO FAR (IN MONTHS)

	Patient		Staff	
	Male	Female	Male	Female
HBs Ag n = number	20.0 ± 10.2 n = 5	16 ± 16.9 n = 2	0	0
Anti-HBs n = number	0	8.0 n = 1	0	0
Total No.	n = 5	n = 3	0	0

DISCUSSION

The frequency of hepatitis B antigen in normal healthy volunteer blood donors in Singapore is 3.1% using the Counter-Immuno-Electrophoresis (CIE) Method, Ong (1). In North American and Australasian Caucasian Communities the frequency is about 0.1%, Simons (2). The incidence in our dialysis patients was 28.5% and in staff was 10.2%.

Since 1966 there has been a steady increase in the number of dialysis centres in European countries and 23 — 43% have endemic hepatitis at any one time, Marmion (3). The United States Center for Disease Control in 1971 (4) reported that over a 5 year period from 1966 — 1970, 80% of dialysis units had sporadic outbreaks of hepatitis. The prevalence for Hepatitis B antigen in European centres was 10.2% in 1972, Gurland (5). In a study from the United States the prevalence rates for HBs Ag in 120 units from 1967 — 1968 was 10% of 1008 patients and 3% of 1070 staff, Marmion (3). The incidence in our centre for Hepatitis B infection in both patients and staff is significantly higher than that reported from European or American Centres.

Mortality rate was 6.9% in European Centres and it ranged from 6 — 28% in centres in various countries, Gurland (5). In an outbreak of Hepatitis B infection in 1971 in Edinburgh, Bone (6) reported a mortality rate of 24% in dialysis patients and 33% in staff. However London et al (7), in a report on sporadic hepatitis from the Delaware Valley Artificial Kidney Clinic in Philadelphia, stated that in no case was hepatic disease reported as a cause of death.

In our series, all had mild illnesses, none required hospitalization for hepatitis per se and there were no deaths from hepatitis. This may be attributed to the increased immunity to Hepatitis B in the population as a whole because of its high incidence in our community.

Using a criterion of antigen positive for 6 months or more for the definition of a chronic carrier, we found that 25% of our patients were carriers for HBs Ag. London et al (7) using a criterion of 7 months or more found that 8% of his patients were carriers. He further observed that males were more likely to become chronic carriers for HBs Ag and females more likely to develop anti-HBs. However in our study there was no significant difference in the distribution of HBs Ag and anti-HBs between the two sexes in our patients.

None of the staff became chronic carriers of HBs Ag and the likely reason for this difference between patients and staff is due to the impaired cell mediated immunity in patients with renal failure resulting in their inability to clear the virus efficiently, Newberry (8), Woo (9).

In conclusion, it can be seen that Hepatitis B virus infection is more prevalent in our dialysis centre than in other centres because of the widespread occurrence of HBs Ag in the general population. However the morbidity is mild and there has been no associated mortality so far.

As long as the patient is on hemodialysis in the centre he runs a risk of infection. The source of infection could arise out of the need to share dialysers which was what happened some years ago, or to shared monitoring devices and associated equipment.

Our blood transfusion service here does not accept blood from donors found to be positive for Hepatitis B

antigen or antibody by the CIE method but considering the relative insensitivity of this test it is conceivable that blood transfusion is an important source of Hepatitis B virus infection in our patients.

The CIE test is about 100 times less sensitive than the reverse passive hemagglutination (RPHA) test and about 1000 times less sensitive than the radioimmunoassay tests, Simons (11). Using a more sensitive test than the CIE, the true rate of infection as well as persistence of HBs Ag or anti-HBs might well be higher.

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