CHAPTER 11: HEPATITIS ON DIALYSIS

Summary

- Patients on haemodialysis run the risk of acquiring Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections.
- Despite the screening of blood products and the use of erythropoietin, the incidence of hepatitis especially HCV remains alarmingly high, suggesting nosocomial transmission within the dialysis unit.
- The overall prevalence of hepatitis is lower in CAPD compared to haemodialysis patients.
- The prevalence of HBV seropositive patients ranged from 1 to 4 % for CAPD and from 5 to 8% for haemodialysis.
- The seroconversion risk of HBV was low and comparable between CAPD and haemodialysis.
- The prevalence of HCV in CAPD ranged between 2 to 6% while the prevalence of HCV in haemodialysis patients is alarmingly high at 17 to 30%.
- The risk of acquiring HCV infection was 2.6 times higher for haemodialysis than for CAPD patients. This risk increased with the number of years on haemodialysis and men were also at greater risk.

Introduction

Hepatitis B virus (HBV) and Hepatitis B Viral (HCV) infections are public health issues within dialysis units. The prevalence of HBV infection in dialysis units has declined from 3.8% in 1980 to 0.9% by 1999 according to the national surveillance of dialysis associated diseases in the United States [1]. In contrast, the prevalence of HCV infection has not declined as markedly, ranging from 5 to 65% depending on geographical area and dialysis center [2]. Its prevalence increases with the duration on dialysis, from 12% for patients on dialysis less than 5 years to 37% for patients on dialysis for more than 5 years [1].

Both HBV and HCV infections are transmitted by percutaneous or permucosal exposure through infected blood or body fluids. Blood transfusion, volume of blood products transfused, number of years on haemodialysis and high prevalence (>30%) of HCV in the dialysis centers are recognized risk factors [3,4].

Results and Discussion

Between 1993 and 2002, the prevalence of haemodialysis (HD) patients with Hepatitis B surface antigen (HbsAg) ranged from 3 to 7%, and anti-HCV antibody 3 to 17% at the time of notification to the registry (Table 11.1). The corresponding figures among CAPD patients were 0 to 5% for presence of HbsAg and 2 to 6% seropositive for anti-HCV (Table 11.2).

Subsequent to the first notification, annual surveys of all patients conducted by the registry showed that the prevalence of HbsAg ranged from 5 to 8% and of anti-HCV antibody 17 to 30% among HD patients. (Table 11.3). The corresponding figures among CAPD patients were 1 to 4% for HbsAg and 0 to 6% for anti-HCV (Table 11.4). Clearly, patients became infected with hepatitis virus especially HCV while on dialysis.

To quantify the risk of infection, we assembled a cohort of patients commencing dialysis between 1997 and 2002, and who were sero-negative for both HBV and HCV at initial notification to the registry. We assumed patients were notified at the time of entry into dialysis. We then tracked their serology status at each subsequent year of survey.

As shown in Table 11.5 and Figure 11.5, the cumulative risk of HBV infection was 1.9% at 5 years on CAPD, and 1.5% for HD. The risks were low and comparable between CAPD and HD. Table 11.6 shows the risk of HBV infection in relation to other patient characteristics. There seems to be a trend of decreasing risk with increasing age and in more recent cohorts; but these were not statistically significant.

The situation with HCV infection is alarmingly different. As shown in Table 11.7 and Figure 11.7, the cumulative risk of HCV infection was 4.4% at 5 years on CAPD, but 15% for HD. These risks are large, especially on HD. The cumulative risk increased with each year on HD and was not just confined to the initial years on dialysis.

Table 11.8 shows the risk of HCV infection in relation to other patient characteristics. Men were at greater risk of acquiring HCV infection; there was no difference noted in the various age groups; and recent cohorts were at higher risk. The risk of infection with HCV was 2.6 times higher for HD than for CAPD patients. Clearly, further investigation is warranted to more precisely characterize the mechanism of transmission, especially in HD. What aspects of our current HD practices are putting patients at such great risk of HCV infection?

Table 11.1 Prevalence of HBsAg positive, Anti-HCV positive and Mixed infection at notification to the registry, HD patients 1993-2002

Year	N	Prevalence of HBsAg positive (%)	Prevalence of Anti-HCV positive (%)	Prevalence of mixed HBsAg positive and Anti-HCV positive (%)
1993	312	5.77	17.63	1.92
1994	445	6.52	15.73	0.45
1995	567	6.70	13.58	1.23
1996	789	4.44	14.45	0.51
1997	1019	4.42	10.21	0.39
1998	1144	4.55	9.27	0.35
1999	1399	5.08	7.86	0.36
2000	1668	5.16	4.98	0.42
2001	1757	4.38	4.04	0.11
2002	1527	3.27	3.34	0.26

Table 11.2 Prevalence of HBsAg positive, Anti-HCV positive and Mixed infection at notification to the registry, CAPD patients 1993-2002

Year	N	Prevalence of HBsAg positive (%)	Prevalence of Anti-HCV positive (%)	Prevalence of mixed HBsAg positive and Anti-HCV positive (%)
1993	69	1.45	5.80	0
1994	121	1.65	4.13	0
1995	170	5.29	4.71	0
1996	220	3.18	2.27	0
1997	197	3.05	5.58	1.52
1998	154	0	3.25	0
1999	209	1.44	3.83	0
2000	226	3.54	4.42	0
2001	339	4.42	3.54	0.59
2002	346	3.76	3.18	0.58

Table 11.3 Prevalence of HBsAg positive, Anti-HCV positive and Mixed infection at annual survey, HD patients 1993-2002

Year	N	Prevalence of HBsAg positive (%)	Prevalence of Anti- HCV positive (%)	Prevalence of mixed HBsAg positive and Anti-HCV positive (%)
1993	718	8	17	1
1994	962	6	26	1
1995	1033	5	30	1
1996	1254	7	25	2
1997	1696	6	23	1
1998	2141	6	22	1
1999	2995	6	23	1
2000	4393	6	25	1
2001	5193	6	23	1
2002	5673	5	21	1

Table 11.4 Prevalence of HBsAg positive, Anti-HCV positive and Mixed infection at annual survey, CAPD patients 1993-2002

Year	N	Prevalence of HBsAg positive (%)	Prevalence of Anti-HCV positive (%)	Prevalence of mixed HBsAg positive and Anti-HCV positive (%)
1993	102	1	0	0
1994	122	3	1	0
1995	256	4	2	0
1996	371	4	6	0
1997	477	3	5	0
1998	541	3	6	0
1999	610	2	5	0
2000	661	2	5	0
2001	780	2	3	0
2002	889	3	4	0

Conclusion

Our 10 year registry report shows a high prevalence of HCV among our haemodialysis patients. The risk of acquiring HCV infection increases with the duration on dialysis suggesting that nosocomial transmission within the haemodialysis unit plays a key role in HCV infection.

Strict implementation of infection control practices as recommended by the CDC guidelines [1], the use of dedicated machines, adequate personnel/patient ratio, isolation of anti-HCV positive patients and dialysers or single use of dialysers may reduce the transmission of HCV [5,6].

Prevalence of HBV is much lower than HCV and has not changed markedly over the years because of implementation of universal precautions, segregation of HBV positive patients, and the use of HBV vaccination. As predialysis patients' immune response is superior to those already on dialysis [7], early vaccination before initiation of dialysis is recommended. Annual monitoring of anti-HBs titres of staff and patients should be done and booster doses of hepatitis vaccine given as needed. Possible factors associated with poor response to vaccination like malnutrition, diabetes, dialysis adequacy and increased age need further studies [7].

Table 11.5 Cumulative risk of sero-conversion to HBsAg positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 1997-2002

Modality	CAPD		HD	
Interval (years)	% Cumulative probability	SE*	% Cumulative probability	SE*
1	0.3	0.1	0.3	0.06
2	0.6	0.2	0.7	0.1
3	1.5	0.4	1.1	0.1
4	1.9	0.6	1.4	0.2
5	1.9	0.6	1.5	0.2

* SE=standard error

Figure 11.5 Cumulative risk of sero-conversion to HBsAg positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 1997-2002

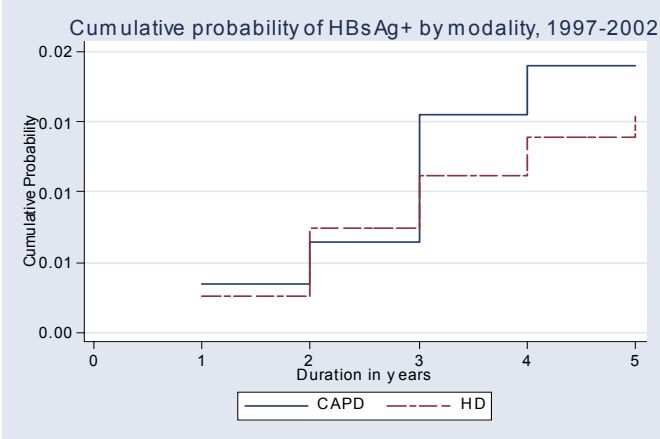


Table 11.6 Risk factors for sero-conversion to HBsAg positive among sero-negative patients at entry into dialysis, All dialysis patients 1997-2002

Factors	N	Risk ratio	95% CI	P value
Gender:				
Male (ref.*)	5269	1.00		
Female	4290	0.74	(0.60,1.39)	0.675
Age:				
<20 (ref.*)	367	1.00		
20-39	1802	0.90	(0.30,2.72)	0.848
40-54	3264	0.77	(0.26,2.30)	0.635
>=55	4126	0.74	(0.25,2.26)	0.601
Diabetes mellitus				
No (ref.*)	5516	1.00		
Yes	4043	1.32	(0.83,2.09)	0.243
Year start dialysis				
1997-1998 (ref.*)	2411	1.00		
1999-2000	3334	0.88	(0.56,1.40)	0.596
2001-2002	3814	0.55	(0.28,1.08)	0.082
Modality:				
CAPD (ref.*)	1426	1.00		
HD	8133	0.84	(0.47,1.52)	0.566

*ref: Reference group

Table 11.8 Risk factors for sero-conversion to Anti-HCV positive among sero-negative patients at entry into dialysis, All dialysis patients 1997-2002

Factors	N	Risk ratio	95% CI	P value
Gender:				
Male (ref.*)	5189	1.00		
Female	4214	0.84	(0.71,0.99)	0.033
Age:				
<20 (ref.*)	363	1.00		
20-39	1764	0.96	(0.57,1.64)	0.891
40-54	3222	1.22	(0.72,2.04)	0.461
>=55	4054	1.01	(0.60,1.71)	0.974
Diabetes mellitus				
No (ref.*)	5420	1.00		
Yes	3983	0.89	(0.74,1.05)	0.170
Year start dialysis				
1997-1998 (ref.*)	2288	1.00		
1999-2000	3291	1.23	(1.02,1.48)	0.025
2001-2002	3824	1.12	(0.86,1.46)	0.393
Modality:				
CAPD (ref.*)	1414	1.00		
HD	7989	2.66	(1.86,3.80)	0.000

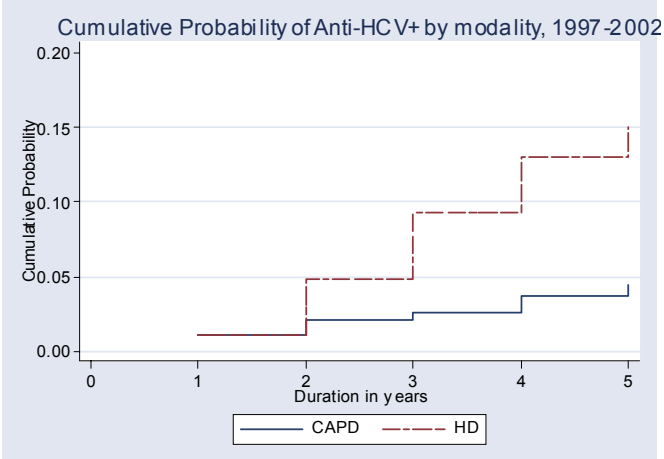
*ref: Reference group

Table 11.7 Cumulative risk of sero-conversion to Anti-HCV positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 1997-2002

Modality	CAPD		HD	
Interval (years)	% Cumulative probability	SE*	% Cumulative probability	SE*
0.5				
1	1.1	0.3	1.2	0.1
2	2.1	0.4	4.9	0.3
3	2.6	0.5	9.3	0.4
4	3.7	0.8	13.0	0.6
5	4.4	1.1	15.0	0.7

* SE=standard error

Figure 11.7 Cumulative risk of sero-conversion to Anti-HCV positive among sero-negative patients at entry into dialysis, comparing HD and CAPD 1997-2002



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