Hepatitis A, B, and non-A, non-B in Danish hospital nursing staff

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SUMMARY A stratified age matched sample of 564 general hospital nurses, assistant nurses, and porters was studied for antibody to hepatitis A virus (anti-HAV), hepatitis B surface antigen (HBsAg), and antibody to hepatitis B surface antigen (anti-HBs), and these data were compared with serum aspartate aminotransferase (AST) and identified episodes of hepatitis. The overall prevalence of anti-HBs was increased twofold compared with blood donors, while no evidence of increased exposure to hepatitis A virus was found. The serological survey showed porters to have a significantly higher prevalence of hepatitis A virus (52%) as well as hepatitis B virus (10.2%) markers compared with the nurses and assistant nurses (39% and 5.3% respectively). In contrast, the clinical data showed the incidence of hepatitis to be four times higher in nurses than in the two other groups during hospital employment. The serological survey may reflect differences in social background of the groups, while the clinical data identified nurses as having the highest occupational hepatitis risk.

A number of episodes of hepatitis in nurses appeared to be due to non-A, non-B agents. AST values, however, did not show any case of liver inflammation not attributable to alcohol. Thus chronic non-A, non-B infections could not be shown in this population group.

The epidemiology of hepatitis A and B has largely been clarified by a number of seroepidemiological surveys during the past 10 years.¹ Professional groups at risk because of exposure to patients' blood have been identified for type B hepatitis, and immunoprophylaxis by vaccination is being initiated.^{2,3} For type A hepatitis the risk for health care workers as a whole appears to be small owing to the absence of chronic infections with this virus, but available data are sparse, especially for the groups which might be most at risk: those who provide direct physical care for patients.^{2,4}

Moreover, the emergence of non-A, non-B hepatitis as one or several infectious entities raises the possibility that such infections by parenteral or oral exposure may provide a risk to hospital personnel.⁵ As no serological markers have been found so far, testing for these infections is restricted to indirect means such as unexplained episodes of hepatitis like illnesses or biochemical evidence of liver cell damage. So far, only a limited number of surveys

following these lines have been reported for health care personnel groups.⁶

In order to investigate the magnitude of these infectious problems in the nursing staff of general hospitals a study was undertaken in a stratified randomly collected sample of nurses, assistant nurses, and porters in general hospitals in the municipalities of Copenhagen and Frederiksberg and the county of Copenhagen.

Material and methods

The study was part of a general health examination of nurses, assistant nurses, and hospital porters. The general design and the study population is described elsewhere.⁷ Here parameters relevant to the occurrence of hepatitis will be emphasised.

From data in the unions for registered nurses, assistant nurses, and hospital porters a random sample was drawn of 60 individuals in each of four age groups (30, 40, 50, and 60) working at general hospitals in the Copenhagen area (population 1.2 million). Ninety per cent of the nurses and

assistant nurses were working in general surgical or medical bed wards; the remainder were employed in various categories of patient wards. The hospital porters were not employed in specified departments but served most clinical departments by patient handling and transportation. Laboratory or surgical staff were not included.

Of 720 invited individuals 27 did not fulfil the criteria for inclusion. A further 129 did not reply or refused to participate, leaving a study group of 564 persons (81.4%): 196 nurses, 182 assistant nurses, and 186 porters.

Each participant filled in a questionnaire regarding previous diseases, especially hepatitis, medication, and intake of alcohol the day before study. A blood sample was drawn for serological analysis and serum aspartate aminotransferase (AST) determination.

Testing for antibody to hepatitis A virus (anti-HAV) was performed with an enzyme immunosorbent method described previously.⁸ Hepatitis B surface antigen (HBsAg) was tested for by a commercial ELISA test kit (Enzygnost, Behring) according to the manufacturer's instructions, while antibody to hepatitis B surface antigen (anti-HBs) determination was by radioimmunoassay (Aus-Ab, Abbott).

Results were compared by means of Fischer's exact test or the χ^2 test.

Results

SEROLOGICAL SURVEY (Table 1)

The overall prevalence of anti-HAV (43.5%) was similar to rates found previously in blood donors (41.6%) and increased with age in all of the study groups as expected from the blood donor data (Fig. 1). The porters, however, had a higher anti-HAV prevalence (51.9%) than the nurses and assistant nurses (combined rate 39.4%, $p < 0.05$).

HBsAg was found in three cases (0.5%), all male porters, who were subsequently found to be healthy carriers, positive for hepatitis B antibody, with normal liver function tests and no previous signs of hepatitis. The overall anti-HBs prevalence (6.4%)

Fig. 1 Age specific prevalence of antibody to hepatitis A virus (anti-HAV) in nurses (N), assistant nurses (A), and hospital porters (P). Insert line: anti-HAV prevalence rate and 95% confidence limits for 318 Danish blood donors.^{9, 10}

Fig. 2 Age specific prevalence of hepatitis B surface antigen (HBsAg) (hatched columns) and antibody to hepatitis B surface antigen (anti-HBs) (open columns) in nurses, assistant nurses, and hospital porters. Insert line: Anti-HBs prevalence rate and 95% confidence limits for 991 Danish blood donors.^{10, 11}

was twice that of the age comparable blood donor population (3.6%, $p < 0.01$, (Fig. 2). Among the study groups the prevalence of HBV markers was high only in porters (10.2%), twice the rate obtained in nurses and assistant nurses (combined rate 5.3%, $p < 0.05$).

Table 1 Prevalence of anti-HAV, HBsAg, and anti-HBs in relation to occupation

	Number	Anti-HAV (%)	HBsAg (%)	Anti-HBs (%)
Nurses	196	76 (38.8)	0	9 (4.6)
Assistant nurses	182	73 (40.1)	0	11 (6.0)
Porters	186	94 (51.9)	3 (1.6)	16 (8.6)
Total	564	243 (43.5)	3 (0.5)	36 (6.4)

Anti-HAV = antibody to hepatitis A virus.

HBsAg = hepatitis B surface antigen.

Anti-HBs = antibody to hepatitis B surface antigen.

Table 2 Attack rates of hepatitis during hospital employment

	No of hepatitis episodes	Person-years at risk	Attack rate (%)
Occupational group			
Nurses	12	3887	0.31
Assistant nurses	2	2053	0.10
Porters	2	2788	0.07
General population (aged 15-64 yr)*	958	6 516 000	0.02

*Notified cases 1978-1979. Drug addicts excluded.

Table 3 Relation of hepatitis and antibody status to occupation

Occupational group	Cases of clinical hepatitis		Current antibody status					
			Anti-HAV		Anti-HBs		None	
	B	D	B	D	B	D	B	D
Nurses (n = 196)	9	12	8	6	1	1	0	5
Assistant nurses (n = 182)	12	2	11	0	0	1	1	1
Porters (n = 186)	6	2	4	1	0	1	2	0
Total (n = 564)	27	16	23	7	1	3	3	6

B = before hospital employment.

D = during hospital employment.

CLINICAL STUDY

Forty three recognised cases of hepatitis were reported in a total of 42 employees. Twenty seven cases occurred before the present hospital employment (21 cases before the age of 18 years) while 16 cases occurred during the employment. Table 2 shows the distribution of these cases in relation to occupational group and calculations of the attack rate per year.

Most cases were in the nurses, the incidence of clinical hepatitis being four times higher than for the two other groups ($p < 0.05$). Hospital records were available for five of the 16 post-employment cases, three being type B hepatitis and two non-A, non-B. Table 3 shows the hepatitis episodes and the current antibody status. Most individuals with hepatitis early in life were anti-HAV positive (85%). Anti-HBs tended to be more common in those who had hepatitis during employment (19%) compared with those with pre-employment hepatitis (4%). Some hepatitis cases with no subsequently demonstrable antibodies were also present, however, and tended to be more common in the employment associated group (38%) when compared with the pre-employment group (11%, $p < 0.01$).

Serum AST was measured to detect possible cases of chronic non-A, non-B hepatitis. The values observed were normally distributed, however, and 24 cases (2.5%) exceeded the upper normal limit (40 U/l) as might be expected. Four individuals had values higher than expected (65-119 U/l), but the questionnaire indicated that all of these had ingested

alcohol the day before the study and one had also undergone cholecystectomy two weeks previously.

Discussion

The present study confirms the accepted, but so far not serologically documented, assumption that HAV is not presently a hazard to nursing staff in general medical or surgical hospital wards.² One explanation for this might be a decrease in exposure owing to the decreasing number of HAV infections in recent years in industrialised countries. A study of sewer workers in the same area, however, showed them to be infected with HAV more frequently than control groups.¹⁰ Thus it seems that the present standards of hygiene in hospitals are capable of preventing this type of enteric infection, which in the case of HAV is characterised by a short lasting and generally preclinical faecal viral excretion.

With regard to HBV infection, the number of HBsAg carriers in the study groups (0.5%) was similar to the figures found for blood donors, and all three cases identified appeared to be non-infectious healthy carriers. Antibodies to HBsAg were twice as common as expected and this finding is essentially the same as those of several other studies of hospital personnel,^{2,12,13} indicating a moderately increased risk of infection even for staff members not regularly exposed to patient blood. Within the three study groups the porters had a higher rate of HBV infection than the two nursing groups despite their less intimate patient contact. A similar difference was

found for anti-HAV. This result might indicate a higher degree of exposure early in life rather than during the present occupation, for the social background of porters differs from that of the two nursing groups.

In this context the clinical data obtained are important. The differences in incidence of clinical hepatitis indicated nurses to be exposed four times as much during their hospital employment as the two other groups. Thus this part of the survey pointed to another risk group not shown by the serological data. This finding underlines the limitations of cross sectional serology studies, which are highly dependent on the selection of control groups. Lack of proper controls may possibly also explain why the antibody testing failed to recognise a hepatitis risk within the nursing group. Alternatively, causes other than HBV or HAV were responsible for the overt cases of hepatitis. The antibody status in nurses with hepatitis during hospital employment was negative in five of 12 cases, suggesting that a considerable proportion of these might have been due to non-A, non-B hepatitis.

Figures regarding the occurrence of non-A, non-B hepatitis in health care personnel are sparse. A few cases have been documented mainly related to parenteral exposure but no general estimates exist and assessment of an occupational risk awaits the establishment of serological methods. Indirect means such as measurement of liver enzymes have been used in blood donors to identify infectious carriers of non-A, non-B hepatitis.¹⁴ This was also used in the present study with negative results except for a few abnormal results which may be accounted for by variation due to the normal distribution. The few increased serum AST values could further be explained by preceding exposure to alcohol.

A decision on vaccination against HBV in general hospital staff is difficult to make on the basis of this study. Overall attack rates based on serology or clinical cases did not reach cost effective figures by any means.¹⁵ But it is questionable whether staff members will accept such an argument. A possible solution might be administration of passive-active immunisation with immunoglobulin and vaccination post exposure to seronegative individuals who experience probable parenteral exposure.¹⁶ Such a strategy would probably protect the staff most at risk.

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