Hepatitis B virus infection in healthcare workers in Brunei Darussalam

Shwe Sin TUN [1], Ayub SADIQ [1], Kyaw Naing WIN [2], Alice LAI [2,] and Vui Heng CHONG [3]
[1] PAPRSB Institute of Health Sciences, Universiti Brunei Darussalam, [2] Occupational Health Division, Ministry of Health, and [3] Division of Gastroenterology and Hepatology, Department of Medicine, RIPAS Hospital, Brunei Darussalam

ABSTRACT

Introduction: Hepatitis B is a common infectious disease which can lead to liver cirrhosis, liver failure and hepatocellular carcinoma. The main aim of this study was to determine the prevalence of Hepatitis B virus (HBV) infection among healthcare workers in Brunei Darussalam. **Materials and Methods:** All healthcare workers in Brunei Darussalam who reported to the Occupational Health Division for pre-employment and periodic medical examinations were reviewed. Information was collated from healthcare records from January 2003 until December 2013 by using a pretested data collection form. Data collected included demographic characteristics of the healthcare workers (gender, age and nationality), work sectors (public and private), laboratory reports of Hepatitis B surface antigen (HBsAg) and presence of other infections (HCV, Syphilis or HIV). **Results:** Out of the 5,466 healthcare workers, the prevalence of hepatitis B was 1.8% (95% confidence interval [CI]: 1.5, 2.2). Hepatitis B infection was highest in males (1.9%; 95% CI: 1.3, 2.5), 41-50 age group (2.4%; 95% CI: 1.5, 3.3), and being Bruneian (2.1%; 95% CI: 1.7, 2.5). Comparison of hepatitis B infected healthcare workers between public and private sectors did not show a statistical significance. There was no association observed between Hepatitis B and co-infection with Syphilis, Hepatitis C or HIV. Of the occupational groups studied, support staff had a significantly higher prevalence for HBV infection compared to doctors (p=0.032). **Conclusion:** The prevalence of HBV infection in Brunei Darussalam remains low. There was little variation in prevalence across the age groups and occupational groups. No increased risk for HBV infection was seen within healthcare workers.

Keywords: Hepatitis B, Hepatitis, prevalence, healthcare professionals

INTRODUCTION

Hepatitis B is a transmissible disease caused by Hepatitis B virus (HBV), a hepadnavirus with a circular genome which has a partially double stranded DNA. HBV infection is one of the main causes of liver cirrhosis, liver failure and hepatocellular carcinoma, especially in the Asia Pacific regions. The acute form of the disease can occur in a well-developed immune system with the infected person remaining asymptomatic [1]; whereas the chronic form occurs in those who acquire the infection in childhood or through the perinatal route. [2, 3] HBV can be transmitted through parenteral or percutaneous contact with blood, saliva or through sexual intercourse from an infected person. The most common route of transmission, however, is vertical transmission when HBV can be passed from mother to foetus at birth. [1, 3]

Correspondence author: Shwe Sin TUN
Pengiran Anak Puteri Rasidah Sa'adatul Bolkiah Bolkiah, Institute of Health Sciences, Universiti Brunei Darussalam, Jalan Tungku Link Gadong, Brunei Darussalam BE 1410.
E mail: shwesin.tun.06@gmail.com

Globally, Hepatitis B infection is one of the tenth leading causes of death. More than two billion people alive today have been infected with HBV either at present or in the past, and amongst these, 350 million remain chronically infected and 75% of these reside in the Asia Pacific regions. [4]

Among the occupational groups who are at risk of exposure to blood borne viruses, healthcare workers are recognised to have an increased risk due to their frequent exposure to blood or serum. According to the World Health Organisation (WHO), it is estimated that 8.6% (approximately three million out of 35 million) of healthcare workers are exposed to occupational percutaneous injuries annually. Of the three million, 67% (approximately two million), are exposed to HBV, resulting in 70,000 HBV infections worldwide. [5]

Currently, there is no data available on the prevalence of hepatitis B among healthcare workers in Brunei Darussalam. Given the known risk of occupational exposure and transmission of HBV in healthcare workers, the aims of this study were to estimate the prevalence of HBV infection among healthcare workers (in terms of gender, age and nationality); to compare the prevalence of HBV infection in healthcare workers between public and private healthcare settings; to identify the relationship between Hepatitis B with other infections such as HCV, HIV and Syphilis; and to compare the prevalence of HBV infection among occupational groups of healthcare workers.

MATERIALS AND METHODS

Study design, Population and Sample: A cross sectional study was carried out on healthcare workers (doctors, nurses, pharmacists, laboratory workers, support staff and others) in Brunei Darussalam who were seen in the Occupational Health Division (OHD) for pre-employment and periodic medical examinations from January 2003 to December 2013. Healthcare workers are defined as those who serve to protect and improve the health of the community, making up the global health workforce. They include doctors, nurses and pharmacists who are professional health service providers; Laboratory workers who are associate health service providers; Support staff and others who are health management and support workers, such as clerical workers, drivers in a hospital, administrative professionals, accountants, craft and trade workers, attendants etc. 6 The target population was all healthcare workers in Brunei Darussalam whilst the source population was all healthcare workers attending pre-employment and periodic medical examinations at OHD over the 10 year period. The inclusion criterion was healthcare workers infected with Hepatitis B. There were no exclusion criteria All healthcare workers were included in the study without sampling. In regards to co-infection of Hepatitis B with other diseases, data was only available from the year 2007 to 2013.

Data Collection: Relevant data for the study were drawn out from completed pre-employment and periodic medical examination screening forms. Data included demographic characteristics of the healthcare workers (age, gender, and nationality), work sectors, laboratory reports of Hepatitis B surface antigen (HBsAg) and presence of other infections (HCV, Syphilis or HIV).

Research Instruments: The data collection form was drafted and pretested on 10 randomly selected health records to establish suitability and feasibility. Further necessary amendments were made based on the findings of the pilot test to ensure reliability and validity.

Statistical Analysis: Statistical analyses were done using IBM SPSS version 20 for Windows. Descriptive statistics such as frequency and percentage were used to describe

demographic characteristics of the study population. The prevalence of HBV infection among healthcare workers (in terms of gender, age and nationality) was estimated using 95% confidence intervals (CIs). Chi-square and Fisher's exact tests of significance was used to compare HBV infection in public and private healthcare workers; to identify the relationship between Hepatitis B with other infections; and to compare the prevalence of HBV infection among occupational groups of healthcare workers. In all hypothesis tests, two-sided tests were used and $p<0.05$ was considered as statistically significant.

Ethical Consideration: Healthcare workers coming for screening were all informed through written consent that data collected may be used for research purposes. However, the data will be made anonymous. Consent to have their information used for research and clinical purposes were obtained from each healthcare worker when they were seen in OHD for their medical examinations. The study protocol was approved by the Medical and Health Research Ethics Committee (MHREC) and the Institute of Health Science Research and Ethics Committee (IHSREC), and access to data from healthcare records was approved by the Director General of Health Services from the Ministry of Health.

RESULTS

From a total of 5,466 healthcare workers in Brunei Darussalam, females accounted for 66.5% of the healthcare worker population, and 41.6% of healthcare workers were in the 21-30 age group. Only 13.6% were in the 51 and above age group. The majority of the healthcare workers were Bruneian (82.8%). Table 1 shows the demographic characteristics of the study population.

Table 1: Demographic characteristics of healthcare workers.

Characteristics	*n* (%)
Gender	
Male	1,831 (33.5)
Female	3,635 (66.5)
Age (years)	
21-30	2,276 (41.6)
31-40	1,322 (24.2)
41-50	1,122 (20.5)
51 and above	746 (13.6)
Nationality	
Bruneian	4,525 (82.8)
Non-Bruneian	941 (17.2)

Prevalence of HBV infection: In general the trend of HBV infection showed a decreased over time as seen in the blood donor population study (Table 2). The prevalence of HBV infection among healthcare workers was 1.8% (95% CI: 1.5, 2.2), slightly higher in males (1.9%; 95% CI: 1.3, 2.5) compared to females (1.8%; 95% CI: 1.4, 2.2.). In terms of age, the prevalence was highest in the age group 41-50 (2.4%; 95% CI: 1.5%, 3.3%). Healthcare workers of Bruneian nationality had a higher prevalence (2.1%; 95% CI: 1.7, 2.5) compared to non-Bruneian nationality (Table 3).

Table 2: Prevalence of HBV and other infections from 2003 to 2013.

Year	HBV infection *n* (%)	HCV infection *n* (%)	HIV infection *n* (%)	VDRL infection *n* (%)
2003	1 (1.0)	-	-	-
2004	21 (21.0)	-	-	-
2005	29 (29.0)	-	-	-
2006	8 (8.0)	-	-	-
2007	2 (2.0)	1 (7.7)	0 (0.0)	2 (28.6)
2008	10 (10.0)	0 (0.0)	1 (50.0)	1 (14.3)
2009	13 (13.0)	1 (7.7)	0 (0.0)	2 (28.6)
2010	4 (4.0)	8 (61.5)	0 (0.0)	0 (0.0)
2011	4 (4.0)	1 (7.7)	1 (50.0)	1 (14.3)
2012	4 (4.0)	2 (15.4)	0 (0.0)	1 (14.3)
2013	4 (4.0)	0 (0.0)	0 (0.0)	0 (0.0)

Data for HCV, HIV and VDRL not available from years 2003 to 2006.

Table 3: Prevalence of HBV infection among healthcare workers in different age groups, gender and nationality.

Variable	*n*	% (95% CI)
Gender		
Male	35	1.9 (1.3, 2.5)
Female	65	(1.4, 2.2)
Age group (years)		
21-30	26	1.1 (0.7, 1.6)
31-40	31	2.3 (1.5, 3.2)
41-50	27	2.4 (1.5, 3.3)
51 and above	16	2.1 (1.1, 3.2)
Nationality		
Bruneian	94	2.1 (1.7, 2.5)
Non-Bruneian	6	0.6 (0.1, 1.1)

Comparison of HBV infection between public and private healthcare workers: Comparison between public and private sector healthcare workers with HBV infection did not show a significant association (p=0.505) (Table 4). The private sector had a higher prevalence with 2.6% (1 out of 38) compared to the public sector with a prevalence of 1.8% (99 out of 5,428).

Relationship between HBV infection and other infections: No significant association was found for HBV and co-infection with Syphilis, HCV or HIV (p = 1.000) (Table 5). The prevalence in the absence of a co-infection with Hepatitis B was higher (1.2%) (40 out of 3,230) compared to when co-infection was present (0%) (0 out of 20). However, it was found that the general trend of infections (HCV, Syphillis and VDRL) decreased throughout the years (Table 2).

Comparison of HBV infection among occupational groups: There was, however, a significant difference seen between different occupational groups of healthcare workers and HBV infection (p=0.003) (Table 6). A further breakdown of the occupations revealed that HBV infection was significantly higher in support staff compared to doctors (p=0.032).

DISCUSSION

In developing countries such as Brunei Darussalam, HBV infection is a recognised occupational disease in healthcare workers which can arise from unsafe handling of contaminated needles and exposure to blood and body fluids. Our study findings revealed that the prevalence of HBV infection in Brunei Darussalam was 1.8%. Comparisons show that this was lower than several studies conducted in Korea (2.4%) 7, in Turkey (3.0%) 8 and in Uganda (8.1%). 9 However, other studies have reported that this was higher than Denmark (1.6%) [10], Brazil (0.8%) [11] and USA (0.7%). [12]

According to the WHO, Brunei Darussalam lies within the zone which is considered highly endemic for chronic HBV infection with a reported prevalence of greater than 8%. [13] However, the true prevalence may be lower than 8% but greater than our reported prevalence since our study is only on healthcare workers. Our findings of HBV infection in healthcare workers were comparable, but slightly higher than a study conducted on blood donors in Brunei Darussalam for transfusion transmissible infections (TTI) (0.92%) [14] in which the study revealed that there was a decreasing trend for HBV infection from 2005 to 2009. However, they concluded that sero-prevalence of HBV was still the highest amongst all the TTI. If the studies had been conducted in the 1990s or early 2000s, the prevalence of HBV infection would have been higher, as demonstrated by two studies carried out in another part of the country which revealed a rate of HBV infection of 4.7% in

Table 4: Prevalence of HBV infection between public and private healthcare settings.

Variable	*n*	Hepatitis B *n* (%)	Non-Hepatitis B *n* (%)	p value
Organisation				
Public	5,428	99 (1.8)	5,329 (98.2)	0.505
Private	38	1 (2.6)	37 (97.4)	

Table 5: Relationship between Hepatitis B and other infections.

Variable	*n*	Hepatitis B *n* (%)	Non-Hepatitis B *n* (%)	P value
Other infections				
Present	20	0 (0.0)	20 (100.0)	1.000
Not present	3,230	40 (1.2)	3,190 (97.4)	

Analysis done with Fisher exact test.

Table 6: Prevalence of HBV infection in the occupational groups of healthcare workers.

Variable	*n*	Hepatitis B *n* (%)	Non-Hepatitis B *n* (%)	X^2 *Statistic* (*df*)	P value
Occupation [b]					
Doctor [c]	895	6 (0.7)	889 (99.3)		
Nurse	2,282	47 (2.1)	2,235 (97.9)		
Pharmacist	116	4 (3.4)	112 (96.6)		
Laboratory worker	212	5 (2.4)	207 (97.6)	18.21 (5)	0.003
Support staff [d]	1,618	38 (2.3)	1,580 (97.7)		
Others [e]	343	0 (0.0)	343 (100)		

a. Chi-square test for independence
b. Only one pair (c vs d) was statistically significant (p = 0.032)
e. Others include: Paramedic (26), Optometrist (13), Public health officer (4), Vaccinator (9), Radiographer (41), Dietitian(20), Podiatrist (5), Orthoptist (3), Speech therapist (5), Microscopist (8), Psychologist (14), Health inspector (14), Audiologist (6), Physiotherapist (25), Occupational therapist (17), Social worker (7), Field worker (22), Nutritionist (1), Dental therapist (5), Phlebotomist (3), Blood bank staff (2), Central Sterile Supply Department personnel (33), Health education officer (2), Special needs worker (9), Ambulance staff (1), Unspecified (48)

blood donors in 1989 [15] and 3.2% in pregnant women in 1990 [16] whilst another study in 1990 showed an overall rate of 6%. [17] Encouragingly, these studies have shown a decline in the annual rate of HBV infection and this may be attributed to the implementation of Hepatitis B vaccination in 1984 to high risk groups as well as universal vaccination coverage for all babies since 1988. [18]

In this study, most of the HBV-infected healthcare workers were male (1.9%) Bruneians (2.1%) from the 41-50 (2.4%) age group. A similar result was reported in a study on healthcare workers in Iraq whereby a higher prevalence of HBV infection was seen in those above the age of 41 years (1.13%), male (1%) and of Iraqi nationality (0.95%). [19] Other studies from Thailand [20] and Palestine [21] have shown similar findings for age and gender (nationality was not included in these studies). In contrast, a study conducted in Korea reported a higher prevalence for HBV infection in healthcare workers in the 30s age group (2.9%). [7] This was postulated to be due to a more careless attitude to work in the younger workers. The study also showed that there was no difference seen in prevalence between male and female (2.4%). [7]

In our study, different occupational groups were found to be associated with an increased prevalence of HBV infection. Occupational groups such as doctors, nurses, laboratory workers and phlebotomists may have a higher exposure to blood borne viruses; however, their risk of HBV transmission is low probably due to proper training and better awareness on standard infection control practices as well as handling of sharps instruments. [22] On the other hand, support staff such as cleaners and disposal workers may lack awareness and education on modes of transmission of HBV.

Our study did not show any associations on HBV infection in healthcare workers between the public and private sectors, nor with other infections (Syphilis, HCV or HIV). This is likely to be due to the small population of HBV-infected healthcare workers and the

low prevalence of co-infection could also be attributed to the low incidence of HIV infections in Brunei Darussalam. To date, up till the end of 2013 there were less than 100 documented cases of HIV infection. [23] Although one other study in Pakistan [24] had a similar result to ours, most studies showed that prevalence of HIV co-infection with HBV was relatively high [25-30], and that co-infection of HBV with other infections such as HCV and Syphilis can also take place. [31] However, a direct comparison cannot be made with our study and the studies mentioned above since different selected populations were involved as opposed to our study, which involved only healthcare workers.

There are several limitations with our study. First the sample size may be considered small. However, the data capture all healthcare workers and is representative for the whole country. Another limitation of the study is the small population size of private healthcare workers. Healthcare workers in the public sector are required to undergo pre-employment and periodic medical examinations in the Occupational Health Division (one of the Divisions of the Department of Health Services in the Ministry of Health), therefore there is sufficient data capture from this sector. Those in the private sector, on the other hand, have the option of having their pre-employment and periodic medical examinations done either in OHD or other private institutions or clinics, hence data captured may not be representative of all healthcare workers in the private sector.

In conclusion, the prevalence of HBV infection in healthcare workers in Brunei remains low but comparable to the blood donor population. There is little variation in prevalence across the occupational groups and the age groups. These prevalences, however, do not appear to be associated with an increased risk of HBV infection. However, measures such as regular training and workshops that cover all levels of healthcare workers must be continued and enhanced to increase the awareness of the danger of blood borne infections.

ACKNOWLEDGEMENTS: We extend our appreciation to Dr Nayake BP Balalla for his contributions to this study and the administration staffs in Occupational Health Department for their help with data collection.

REFERENCES

1: Franco E, Barbara B, Marino MG, Meleleo C, Serino L, Zaratti L. Hepatitis B: epidemiology and prevention in developing countries. World J Hepatol. 2012; 4:74-80.

2: WHO. Hepatitis B. Fact Sheets2013.

3: Kelly D. Viral Hepatitis B and C in children. J R Soc Med. 2006; 99:353-7.

4: WHO. Hepatitis B: WHO/CDS/CSR/LYO/2002.2: Hepatitis B 2002 [cited 2015 1st March]. Available from: http://www.who.int/csr/disease/hepatitis/whocdscsrlyo20022/en/print.html.

5: WHO. Healthcare Worker Safety 2011 [cited 2015 1st March]. Available from: http://www.who.int/injection_safety/toolbox/en/AM_HCW_Safety_EN.pdf.

6: Mohr J. The World Health Report 2006. World Health Organisation 2006.

7: Bo-Moon S, Hyeon Mi Y, Ae Sook L, Sang Keun P. Seroprevalence of hepatitis B virus among health care workers in Korea. J Korean Med Sci. 2006; 21:58-62.

8: Ozsoy M, Oncul O, Cavuslu S, Erdemoglu A, Emekdas G, Pahsa A. Seroprevalences of hepatitis B and C among health care workers in Turkey. J Viral Hepatitis. 2003; 10:150-6.

9: Ziraba AK, Bwogi J, Namale A, W Wainaina C, Mayanja-Kizza H. Sero-prevalence and risk factors for hepatitis B virus infection among health care workers in a tertiary hospital in Uganda. BMC infectious diseases. 2010; 10:191.

10: Fisker N, Mygind LH, Krarup HB, Licht D, Georgsen J, Christensen PB. Blood borne viral infections among Danish Health Care Workers – frequent blood exposure but low prevalence of infection. Euro J Epidemiol. 2004; 19:61-7.

11: Ciorlia LA, Zanetta DM. Hepatitis B in healthcare workers: prevalence, vaccination and relation to occupational factors. Brazilian J Infect Dis. 2005; 9:384-9.

12: Pattison PC, Maynard JE, Berquist KR, Webster HM. Epidemiology of Hepatitis B in Hospital Person-

nel. Am J Epidemiol. 1974; 101:59-64.

13: WHO. Global Alert and Response (GAR) [cited 13th April 2015]. Available from: http://www.who.int/csr/disease/hepatitis/whocdscsrlyo20022/en/index1.html.

14: Teo KS, Saparudin MS, Zaini Z, et al. Transfusion transmissible infections in Brunei Darussalam: A blood donor study. Brunei Int Med J. 2011; 7:321-7.

15: Sebastian VJ, Bhattacharya S, Ray S, Ahmad MZ. Hepatitis-B surface antigen and VDRL in healthy blood donors of Brunei Darussalam. Singapore Med J. 1989; 30:568-70.

16: Sebastian VJ, Bhattacharya S, Ray S, Daud JH. Prevalence of hepatitis-B surface antigen in the pregnant women of Brunei Darussalam. Southeast Asian J Trop Med Public Health. 1990; 21:123-7.

17: Alexander MJ, Sinnatamby AS, Rohaimah MJ, Harun AH, Ng JS. Incidence of hepatitis B infection in Brunei Darussalam--analysis of racial distribution. Ann Acad Medicine Singapore. 1990; 19:344-6.

18: WHO. Western Pacific Regional Plan for Hepatitis B Control Through Immunisation. Manila, Philippines: 2007.

19: Al-Saad T, Al-Alousi BM, Khalaf NM, Razak WA. Prevalence of Hepatitis B and C Viruses among Medical Staff in Ramadi General Hospital. Iraq Acad Sci J. 2009; 7:68-75.

20: Chiarakul S, Eunumjitkul K, Vuttiopas S, Vorapimol A-R, Kaewkungwal J, Poovorawan Y. Seroprevalence and Risk Factors of Hepatitis B Virus Infection among Health Care Workers at the Institute of Neurology. J Med Assoc Thailand. 2007; 90:1536-45.

21: Zakaria A, Majdy D. Serologic evaluation for hepatitis B and C among healthcare workers in Southern Gaza Strip (Palestine). J Islam Uni Gaza (Natural Sciences Series). 2004; 12:153-64.

22: Guidelines on Management of Healthcare Workers with Occupational Exposure to HIV and Hepatitis B and C. Brunei Darussalam: Ministry of Health, Brunei Darussalam; 2005.

23: Global AIDS Progress Reporting 2014 in Brunei Darussalam: 2014.

24: Attaullah S, Khan S, Sultan Ayaz N, et al. Prevalence of HBV and HBV vaccination coverage in health care workers of tertiary hospitals of Peshawar, Pakistan. Virol J 2011; 8:275.

25: Badrize N, Chkhartishvili N, Abutidze A, Gatserelia L, Sharvadze L. Prevalence of hepatitis B and C among HIV positive patients in Georgia and its associated risk factors. Georgian Med News. 2008; 165:54-60.

26: Alpana R, Dwivedi S, Bhattacharya S. Hepatitis B, hepatitis C and HIV co-infection at an antiretroviral centre in Delhi. Trop Doctor. 2011; 41:154-6.

27: Seme K, Lunar M, Tomazic J, et al. Low prevalence of hepatitis B and C infections among HIV-infected individuals in Slovenia: a nation-wide study, 1986-2008. Acta Dermatovenerol Alp Pannonica Adriat. 2009; 18:153-6.

28: Barthe R, Huijgen Q, Taljaard J, Hoepelman A. Hepatitis B/C and HIV in sub-Saharan Africa: an association between highly prevalent infectious diseases. A systematic review and meta-analysis. Int J Infect Dis. 2010; 14:1024-31.

29: Thio C, Seaberg E, Skolasky RJ, et al. HIV-1, hepatitis B virus, and risk of liver-related mortality in the Multicenter Cohort Study (MACS). Lancet. 2002; 360:1921-6.

30: Nikolopoulos G, Paraskevis D, Hatzitheodorou E, et al. Impact of hepatitis B virus infection on the progression of AIDS and mortality in HIV-infected individuals: a cohort study and meta-analysis. Clin Infect Dis. 2009; 48:1763-71.

31: Tessema B, Yismaw G, Kassu A, et al. Seroprevalence of HIV, HBV, HCV and syphilisinfections among blood donors at GondarUniversity Teaching Hospital, Northwest Ethiopia:declining trends over a period of five years. BMC Infect Di. 2010; 10:111.