Hepatitis B virus infection in healthcare workers in Brunei Darussalam

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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; whereas the chronic form occurs in those who acquire the infection in childhood or through the perinatal route. 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.
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.

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

- **HBV infection n (%)**
- **HCV infection n (%)**
- **HIV infection n (%)**
- **VDRL infection n (%)**

Data for HCV, HIV and VDRL not available from years 2003 to 2006.
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%) \( (40 \text{ out of } 3,230) \) compared to when co-infection was present (0%) \( (0 \text{ out of } 20) \). However, it was found that the general trend of infections (HCV, Syphilis 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 3: Prevalence of HBV infection among healthcare workers in different age groups, gender and nationality.**

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

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Hepatitis B n (%)</th>
<th>Non-Hepatitis B n (%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>5,428</td>
<td>99 (1.8)</td>
<td>5,329 (98.2)</td>
<td>0.505</td>
</tr>
<tr>
<td>Private</td>
<td>38</td>
<td>1 (2.6)</td>
<td>37 (97.4)</td>
<td></td>
</tr>
</tbody>
</table>
blood donors in 1989 \(^1\) and 3.2% in pregnant women in 1990 \(^2\) whilst another study in 1990 showed an overall rate of 6%. \(^3\) 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. \(^4\)

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. \(^5\) 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.

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REFERENCES
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