



Seroprevalence of Hepatitis B among healthcare workers in Connaught Hospital, Sierra Leone

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Abstract

Globally, around 80% of individuals exposed to Hepatitis B Virus (HBV) develop chronic infection; while 3–11% will develop liver cirrhosis within 20 years. HBV transmission is increasingly driven by intravenous drug use¹. Medical injections and transfusions are predominant sources of HBV infection in many countries. The emergence of IDU in settings where the prevalence of HBV is high (Africa, the Middle East and South East Asia) presents an additional public health threat. This study is described the distribution of HBV seroprevalence according to age groups, sex, occupation and educational status among healthcare workers working at the Connaught Hospital in Sierra Leone. This is a cross sectional study that analyzed the laboratory records of 79 HBV infected healthcare personnel in order to determine the seroprevalence of HBV by sex, occupation type, educational levels and age groups. The study participants are confirmed HBV positive cases who were tested between the periods May 2017 to August 2018. All study participants are healthcare workers at Connaught Hospital in Sierra Leone and belong to varying age groups and educational background. The median age of HBV cases was 34 (IQR= 38 – 29). Majority (37/79) of HBV cases belongs to the age group 25-35 years; only few (5/79) belongs to the age group 20-25 years. Our finding shows that there are more men than women infected with HBV. This could be due to the fact that most men don't practice safe sex.

Keywords: workers, Seroprevalence, healthcare, HBV

1. Introduction

1.1 Background

Globally, around 80% of individuals exposed to Hepatitis B Virus (HBV) develop chronic infection; while 3–11% will develop liver cirrhosis within 20 years. HBV transmission is increasingly driven by intravenous drug use^[1]. Medical injections and transfusions are predominant sources of HBV infection in many countries. The emergence of IDU in settings where the prevalence of HBV is high (Africa, the Middle East and South East Asia) presents an additional public health threat.

HBV is a highly contagious infection that is contracted parenteral, sexual intercourse and by the vertical (perinatal transmission) routes. Five percent adults HBV cases develop to chronic HBV infection (CHB). Most of the 350 million global CHBs were infected in childhood. Cirrhosis and death due to HCC are important sequelae of CHB^[2].

Despite its higher prevalence and transmissibility, viral hepatitis has received far less global attention than HIV. The World Health Organization (WHO) is reported prevention and control efforts as “successful but fragmented [with no] comprehensive strategy for viral hepatitis”^[3]. At the WHO’s 63rd World Health Assembly in May 2010, a resolution was passed to establish “goals and strategies for disease control, increasing education and promoting screening and treatment” of people infected with HBV and HCV^[4]. The WHO argues that healthcare personnel are particularly important groups that need to be specifically targeted for prevention and treatment of both HBV and HCV. For such efforts to be appropriately scaled and targeted, policymakers and healthcare professionals need accurate and detailed data on the size of the population concerned, as has been undertaken for HIV^[5].

1.2. Problem statement

There have been no global systematic reviews of HBV prevalence among healthcare personnel. Previous reviews of healthcare personnel infected with HBV have shown it to be skewed in geographic coverage^[6]. Most HBV studies do not present estimates of chronic hepatitis A, D or E viral infection (HAV, HDV, HEV). Chronic HAV infection rarely; adults are also mostly immune to the infection in developing countries, making HAV epidemics uncommon. However, with an increase in sanitation HAV epidemiological pattern may change in some populations^[7]. HDV has been associated with healthcare personnel; however, the extent of the literature on HDV (which requires concurrent HBV for infection to be established) is far more limited and the diversity in prevalence, even in high-HBV prevalence countries, makes extrapolation across countries problematic^[8]. HEV is endemically transmitted and HEV data for IDUs is scarce.

1.3. National prevalence of HBV

Hepatitis B is considered a major global health problem. According to the World Health Organization (WHO), hepatitis B caused around 887,000 deaths in 2015, and it was estimated that 257 million people were living with hepatitis B virus (HBV) infection that year (defined as hepatitis B surface antigen positive). WHO estimates that 6.1% of adults in the Africa Region are infected with HBV^[9]. The hepatitis B virus is detected by a rapid test kit to detect the hepatitis B antigen (HBsAg). In Sierra Leone, clinics and hospitals do not generally test patients for HBV, instead concentrating on HIV for pre-operation screening, pregnant women, and blood donations. Tests for hepatitis B antigen can be taken at large hospitals, but patients must pay for the test. There is no information available from the Sierra Leone government on HBV prevalence in the country.

Three recent papers have discussed the prevalence of the hepatitis B virus in different parts of Sierra Leone. A 2005 paper found that 6.2% of middle and upper class women in Freetown tested positive for HBV when given prenatal tests. Higher rates were found in studies in 2017 in Massaje (Tonkolili District) where 15% of 214 male and 13% of 112 female candidate blood donors tested positive, and in the Bo urban area where 21.4% of 308 asymptomatic patients at Bo Government Hospital tested positive^[10].

This paper describes a similarly high prevalence of HBV among employees of an international mining company in Moyamba District. The name of the mining company will

remain anonymous to protect the identity of the study group. Among the general population of Sierra Leone there is little knowledge of the signs and symptoms, means of transmission, diagnosis, and prognosis of hepatitis B. Local people may interpret the symptoms as chronic malaria because eyes may be jaundiced, or as poisoning because the abdomen may be distended. This lack of knowledge is mainly due to the absence of public health information on hepatitis, from the lack or high cost of testing kits, and from inadequate health and science instruction in local schools. In Sierra Leone, tests for HBV are normally done only after chronic symptoms have been detected.

Mining is a major industry in Sierra Leone with bauxite, rutile, diamond, iron, and gold mines being major employers and contributors to the country’s economy. The companies draw large numbers of workers from around the country and from overseas. The majority of workers are males who may leave their families to work and live in mining communities. In 2016 the mining company in this study had 473 employees of which over 30 were from countries outside Sierra Leone^[11]. The company has its own health facilities that provide outpatient services for employees and dependents.

1.4. HBV mode of transmission

The hepatitis B virus can survive outside the body for at least 7 days. During this time, the virus can still cause infection if it enters the body of a person who is not protected by the vaccine. The incubation period of the hepatitis B virus is 75 days on average, but can vary from 30 to 180 days. The virus may be detected within 30 to 60 days after infection and can persist and develop into chronic hepatitis B.

In highly endemic areas, hepatitis B is most commonly spread from mother to child at birth (perinatal transmission), or through horizontal transmission (exposure to infected blood), especially from an infected child to an uninfected child during the first 5 years of life. The development of chronic infection is very common in infants infected from their mothers or before the age of 5 years.

Hepatitis B is also spread by percutaneous or mucosal exposure to infected blood and various body fluids, as well as through saliva, menstrual, vaginal, and seminal fluids. Sexual transmission of hepatitis B may occur, particularly in unvaccinated men who have sex with men and heterosexual persons with multiple sex partners or contact with sex workers. Infection in adulthood leads to chronic hepatitis in less than 5% of cases. Transmission of the virus may also occur through the reuse of needles and syringes either in health-care settings or among persons who inject drugs. In addition, infection can occur during medical, surgical and dental procedures, through tattooing, or through the use of razors and similar objects that are contaminated with infected blood.

1.5. Risk Factors for HBV

The hepatitis B virus (HBV) is highly contagious and may be present in blood and body fluids, including semen and vaginal secretions. The saliva of people with HBV may contain evidence of the virus but in such small concentrations that kissing does not spread HBV. Here are the most common ways hepatitis B is transmitted:

- Sex with an infected partner
- Acquired at birth from an infected mother
- Sharing injection drug equipment (including needles, syringes, cookers, drug-preparation equipment)

- Contact with blood or open sores of an infected person
- Needle stick or other skin puncture
- Sharing items such as glucose monitors, razors or toothbrushes with an infected person

Hepatitis B may also be spread through non-injection drugs (cocaine straws and crack pipes) due to the possibility of exposure to blood. An unsterilized instrument may transmit HBV during acupuncture, tattooing and body piercing.

Hepatitis B is not spread through food or water, sharing eating utensils, breast feeding, and hugging, kissing, hand holding, coughing or sneezing.

HBV may live outside the body for at least seven days and still be potentially infectious.

Hepatitis B vaccination has dramatically reduced the risk of HBV in the United States. To further reduce risk of transmitting hepatitis B, all health care workers and pregnant women are screened and or immunized. Contact your health care provider for a blood test if you haven't been immunized and have any of the following hepatitis B risk factors:

- Your mother was infected at the time of your birth.
- You had sex with an infected person.
- You used drugs or shared injection drug equipment with someone who may be infected.
- You had household contact with someone who has hepatitis B.
- You had an occupational exposure to blood or blood-contaminated body fluids, because you work in health care or public safety, for example.
- You have HIV.
- You are a man who has had sex with men.
- You have ever been on long-term kidney dialysis.
- You are in a correctional facility.
- You are a resident or staff in a facility for developmentally-disabled persons.
- You have evidence of liver disease (e.g., persistently abnormal liver function tests).

You were born in or traveled to regions with a moderate to high prevalence of HBV infection: Asia, Africa, the Pacific Islands, the Middle East, Eastern Europe (except Hungary), Malta, Spain, and indigenous populations of Greenland, Caribbean, Mexico, Guatemala, Honduras, South America, Alaska Natives and indigenous populations in Northern Canada

1.6. Aim and Objectives

1.6.1. Aim

The aim of this study is describe the distribution of HBV seroprevalence according to age groups, sex, occupation and educational status.

1.6.2. Objectives

1. To determine the distribution of HBV according to the age groups of the healthcare workers?
2. To determine the distribution of HBV according to the sex of the healthcare workers?
3. To determine the distribution of HBV according to the sex of the healthcare workers?
4. To determine the distribution of HBV according to the occupational status of the healthcare workers?

1.7. Limitation

One limitation to this study is that it is not clear whether healthcare providers became infected prior to taking up duties. This limitation is however resolved because it is cross sectional and not an etiological study.

2. Literature Review

2.1. Global HBV distribution

At least 600000 individuals worldwide annually die of hepatitis B virus (HBV)-related diseases, such as chronic hepatitis B (CHB), liver cirrhosis (LC), and hepatocellular carcinoma (HCC). Many factors associated including viral load, genotype, and specific viral mutations, are known to affect HBV disease progression (Phelps B, *et al.* 2003) ^[8].

HBV genome has eight well-known genotypes (A-H); two new genotypes, I and J, have also been identified. Some studies have reported that different genotypes and sub-genotypes show different geographical distribution, and that differences in genotypes relates to disease progression, clinical progression, response to antiviral treatment, and prognosis. HBV genotype A is widespread in sub-Saharan Africa, Northern Europe, and Western Africa; HBV genotypes B and C are common in Asia; genotype C is primarily observed in Southeast Asia; genotype D is dominant in Africa, Europe, Mediterranean countries, and India; genotype G is reported in France, Germany, and the United States; and genotype H is commonly encountered in Central and South America. Genotype I has recently been reported in Vietnam and Laos.

The newest HBV genotype, genotype J, has been identified in the Ryukyu Islands in Japan. Geographic distribution of HBV genotypes may be related to route of exposure. For example, genotypes B and C are more common in high-endemic regions of perinatal or vertical exposure, which plays an important role in viral transmission. Other genotypes are primarily observed in regions of horizontal exposure ^[9-11]. Therefore, genotyping provides an epidemiological clue in the investigation of acquisition, because this lies in the geographical distribution of HBV. Figure 1 and 2 shows HBV genotype and chronic HBV distributions across the world.

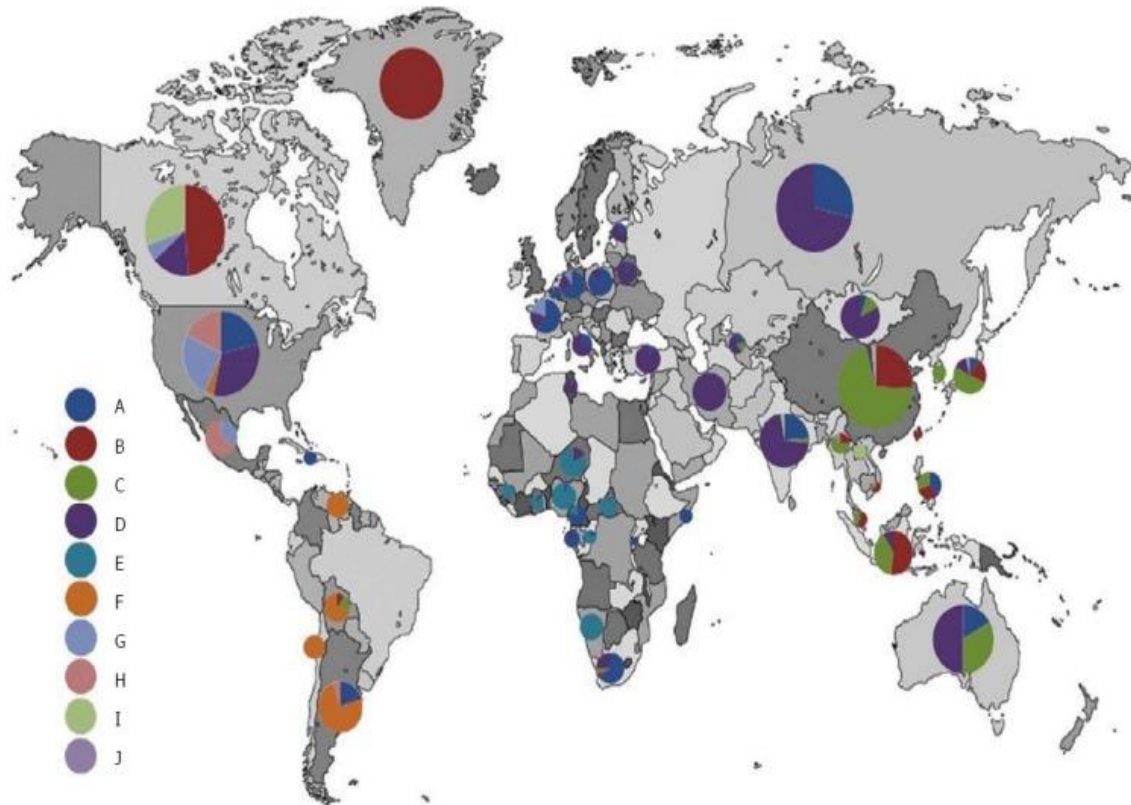


Fig 1

Global Distribution of Chronic Hepatitis B Infection

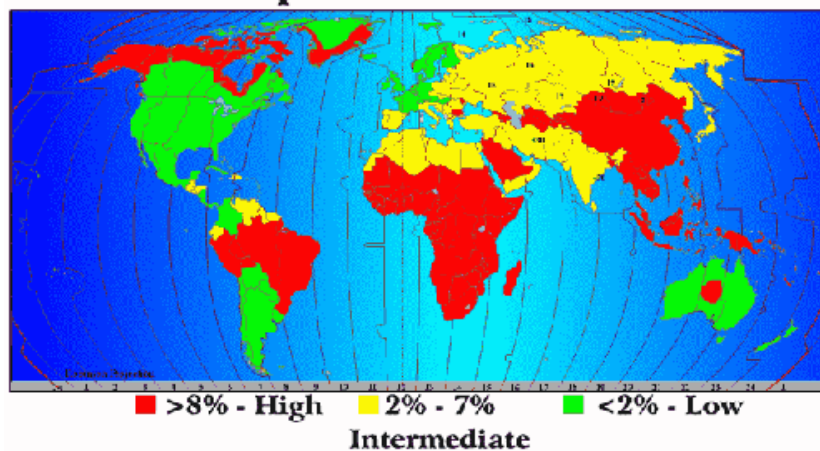


Fig 2

2.2. HBV seroprevalence

Hepatitis B prevalence is highest in the WHO Western Pacific Region and the WHO African Region, where 6.2% and 6.1% respectively of the adult population is infected. In the WHO Eastern Mediterranean Region, the WHO South-East Asia Region and the WHO European Region, an estimated 3.3%, 2.0% and 1.6% of the general population is infected, respectively. 0.7% of the population of the WHO Region of the Americas is infected ^[12].

2.3. HBV treatment and management

No specific treatment exists for *acute* hepatitis B. The aim of any care is to maintain comfort and adequate nutritional balance, including replacement of fluids lost from vomiting and diarrhoea. Chronic hepatitis B infection however can be

treated with medicines, including oral antiviral agents. Such treatment can slow the progression of cirrhosis, reduce incidence of liver cancer and improve long term survival.

World Health Organisation (WHO) recommends the use of oral treatments - tenofovir or entecavir since they are the most potent drugs to suppress HBV and they rarely lead to drug resistance. Compared with other drugs, tenofovir or entecavir are simple to take (1 pill a day), and have few side effects so require only limited monitoring.

Entecavir is off-patent, but availability and costs vary widely. Tenofovir is protected by a patent until 2018 in most upper-middle- and high-income countries, where the cost ranged from US\$ 400 to US\$ 1500 for a year of treatment in February 2017. While some middle-income countries (such as China and the Russian Federation) still face patent barriers

in accessing tenofovir, generic tenofovir is affordable in most countries where it is accessible. The Global Price Reporting Mechanism (GPRM) indicates that the cost for a year of treatment ranged from US\$ 48 to US\$ 50 in February 2017 [13].

In most people, however, the treatment does not cure hepatitis B infection, but only suppresses the replication of the virus. Therefore, most people who start hepatitis B treatment must continue it for life.

There is still limited access to diagnosis and treatment of hepatitis B in many resource-constrained settings. In 2015, of the 257 million people living with HBV infection, 9% (22 million) knew their diagnosis. Of those diagnosed, the global treatment coverage was only 8% (1.7 million). Many people are diagnosed only when they already have advanced liver disease [15].

Among the long-term complications of HBV infections, cirrhosis and hepatocellular carcinoma cause a large disease burden. Liver cancer progresses rapidly, and since treatment options are limited, the outcome is in general poor. In low-income settings, most people with liver cancer die within months of diagnosis. In high-income countries, surgery and chemotherapy can prolong life for up to a few years. Liver transplantation is sometimes used in people with cirrhosis in high income countries, with varying success.

2.4. Sierra Leone HBV prevalence

Sierra Leone lacks recent data on HBV. Most published works on HBV were done few decades ago and were focused on the seroprevalence of HBV in the capital city Freetown. One such study on adults seeking laboratory testing reported a 21.7% (43/198). A similar study on pregnant women ages 16-40 years reported a 6% (19/302) HBsAg prevalence [13]. A small study of 6-12-year-old schoolchildren found that 18% (12/66) of the students were HBsAg positive⁹, and a study of pregnant women ages 15-40 years that collected data in 1995-1996 found that 11.3% (20/179) of the women were HBsAg positive [7].

3. Methodology

3.1. Study participants

This is a cross sectional study that analyzed the laboratory records of 79 HBV infected healthcare personnel in order to determine the seroprevalence of HBV by sex, occupation type, educational levels and age groups. The study participants are confirmed HBV positive cases who were tested between the periods May 2017 to August 2018. All study participants are healthcare workers at the Connaught Hospital in Freetown, Sierra Leone and belong to varying age groups and educational background.

3.2. Data collection

The Connaught Hospital from where the analysed data in this study was obtained from is located in Freetown, Western Area which is the capital city of Sierra Leone. The laboratory records of the study participants were retrieved from the Connaught Hospital after a written consent was obtained from the hospital authorities. This study analyzes secondary data of HBV seropositive healthcare personnel who were diagnosed between the periods May 2016 to August 2018 by laboratory technicians.

3.3. HBV laboratory tests

Study participants were tested for HBV by detecting the presence of the viral surface antigen (HBsAg) in the blood/serum using parallel testing with latex slide agglutination and immunochromatic strips [13]. The appearance of an agglutination reaction and coloured line indicates a seropositive latex slide agglutination and immunochromatic strips HBV test result respectively. Discordant samples are repeat-tested first to eliminate technician error and retested with a third assay - HBsAg Haemagglutination assay [14], which use sensitized chicken erythrocytes. The analytical sensitivity and specificity for the HBsAg Haemagglutination assay is 95% and 99% respectively.

3.4. Statistical analysis

This study used R software was used for both descriptive and exploratory statistical analysis of HBV patients' socio-demographic in this study. The HBV seropositive patients' demographic characteristics analyzed in this study include age (continuous and categorical), sex, occupation, and educational status.

3.5. Ethics and privacy Ethical

Clearance for this study was obtained from the Njala University Ethics Committee which reviewed the study protocol. This study used anonymized patient medical records and was declared to have met the criteria for exemption from obtaining informed consent from the study participants.

4. Results

4.1. Age distribution of HBV cases

The median age of HBV cases was 34 (IQR= 38 – 29). Majority (37/79) of HBV cases belongs to the age group 25-35 years; only few (5/79) belongs to the age group 20-25 years (Figure 1).

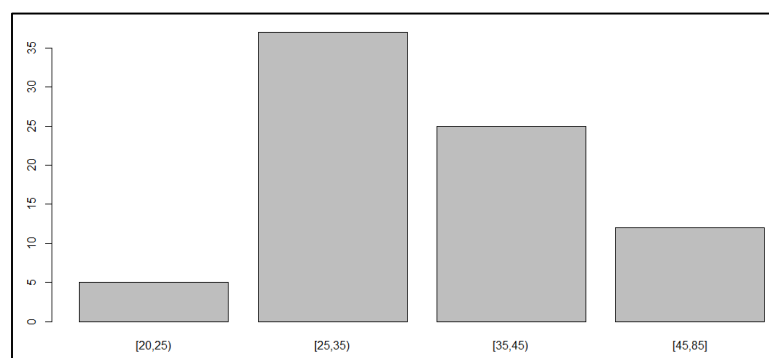


Fig 3: Distribution of HBV cases according to age groups

4.2. Distribution of HBV according to sex

From Table 1, slightly more (51/79) men were infected with HBV than women (X-squared = 42.528, df = 20, p-value = 0.002359).

4.3. Distribution of HBV according to occupational status

Majority (29/79) of the HBV cases were nurses; few (1/79) were store keeper and scrub nurses respectively (Table 1).

Table 1: Distribution of HBV according to sex and occupational status

Variable	N	%
Men	51	64.6
Women	28	35.4
Ambulance driver	11	18.6
CHA	2	3.4
Cook	3	3.8
CHO	5	6.8
Dentist	2	3.4
Lab technician	5	6.8
Medical doctor	2	3.4
Mortuary technician	2	3.4
Nurse	29	36.7
Mid wife	4	5.1
Monitoring officer	2	3.4
Office assistant	2	3.4
Porter	6	7.6
Scrub nurse	1	1.3
Security	2	3.4
Store keeper	1	1.3

4.4. Distribution of HBV by educational status

Majority (43/78) of the HBV infected healthcare workers had university level education; only 3/78 had BECE level education.

Table 1: Distribution of HBV according to educational status

Variable	N	%
BECE	3	3.8
Diploma	4	5.1
Non	5	6.8
Tertiary	17	21.5
University	43	54.4
WASSECC	7	8.9
Total	79	100

5. Discussion, Conclusion and Recommendations

5.1. Discussion

Annually, there are approximately 620,000 HBV related deaths each year [14]. Three quarter of the global population are infected with HBV, six percent are chronic carriers and over 600,000 people die annually from acute HBV disease or chronic sequelae secondary to HBV infection [14]. HBV transmission continues to increase worldwide despite the upscaling of HBV management programmes. HBV, HCV, syphilis and genital herpes Type 2 and HIV share common transmission routes. Sierra Leone has a growing HBV epidemic. Some studies have estimated the national HBsAg seroprevalence rate between 2.6%-5.1% [15] although few independent investigations have documented alarming seroprevalence rates for the infection for different population groups in the country [17].

5.1.1. Age distribution of HBV cases

Majority (37/79) of HBV cases belong to the age group 25-35 years. This high seroprevalence could be associated to the fact that this age group is the most sexually activity.

5.1.2. Distribution of HBV cases by sex

Our finding shows that there are more men than women infected with HBV. This could be due to the fact that most men don't practice safe sex.

5.1.3. Distribution of HBV cases by occupational level

Majority (29/79) of the HBV cases were nurses which shows that the risk of HBV is high among people who coming in direct contact with human body fluids or organs.

5.1.4. Distribution of HBV cases by educational background

Majority (43/78) of the HBV infected healthcare workers had university level education which implies that the risk for HBV infection is associated with higher education which is also associated with occupation.

5.2. Conclusion

From this study results it means men, healthcare workers of the age group 25-35 years and nurses are at high risk of HBV infection and should be targeted for special preventive action and or services.

5.3. Recommendations

This study recommends more studies to monitor changes in the seroprevalence of HBV as well as to promote behaviors that can reduce the current prevalence among healthcare workers.

- That communities should embark on HBV outreach activities to foster and enable better understanding of the health issues relating to the infection.
- Expand training and research opportunities in HBV prevalence reduction activities.

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