

# SEROPREVALENCE OF HEPATITIS B AND C VIRUS INFECTIONS AMONG LAO BLOOD DONORS

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**Abstract.** There have been no previous reports of the prevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV) infections in Lao PDR. From 2003 to 2005, 13,897 first-time blood donors were screened for the presence of hepatitis B surface antigen (HBsAg) and hepatitis C virus antibody (anti-HCV). The seroprevalence of HBsAg positive blood donors was 8.7%. The prevalence among males (9.7%) was higher than in females (6.2%). The prevalence of anti-HCV positive blood donors was 1.1%, with no significant differences between males (1.1%) and females (1.0%). Annual positive rates for HBsAg and anti-HCV during the years 2003 to 2005 did not differ significantly. Lao PDR has a high endemicity of HBV carriers (8.7%). Dual infection with HBV and HCV was 0.12%. For preventing HBV infection, the country introduced DPT-Hepatitis B vaccines into the National Immunization Program in 2001. The large reservoir of HBV and HCV infections will cause an enormous burden of patients with cirrhosis and hepatocellular carcinoma in the future.

## INTRODUCTION

Infections with hepatitis B virus (HBV) and hepatitis C virus (HCV) are a worldwide public health problem. This is related to the continuing occurrence of new infections and the presence of a large reservoir of chronically infected persons. They are at higher risk for morbidity and mortality due to long-term complications of chronic infection, such as cirrhosis and hepatocellular carcinoma (HCC) (Lavanchy, 2002).

It is estimated that more than 2 billion people, about one-third of the world's population, have been infected with HBV at some time in their lives. Of these, about 350 million

remain infected chronically and have become carriers of the virus (WHO, 2000a). More than three-quarters of HBV infections occur in Asia, the Middle East and Africa. Although the world can be broadly classified into regions of high, intermediate and low HBV endemicity, there are substantial differences between countries on the same continent. Southeast Asia had previously been classified as having high endemicity, but China is now the only country in Asia that remains in this category, with a 7-20% prevalence of hepatitis B surface antigen (HBsAg). Countries with intermediate endemicity (2-7% HBV carriers) include India, Korea, the Philippines, Taiwan and Thailand, and those with low endemicity (<2% HBV carriers) include Japan, Singapore, and Malaysia (Andre, 2000).

The WHO estimates that about 3% of the world's population has been infected with HCV and that some 170 million are chronic carriers

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at risk of developing liver cirrhosis and/or liver cancer (WHO, 2000b). The prevalences of HCV infection in some countries in Africa (5.3%), the Eastern Mediterranean (4.6%), the Western Pacific (3.9%) and Southeast Asia (2.2%) are high compared to North America (1.7%), Europe (1.0%), Thailand (1.5%), China (1.3%), Japan (1.1%) Taiwan (1.0%) and Korea (0.6%) (Merican *et al*, 2000; WHO, 2000b). Much higher rates of HCV infection in the general population have been reported for Egypt (13.8%) and Mongolia (10.7%) (Deuffic-Burban *et al*, 2006; Tsatsralt-Od *et al*, 2005).

There have been no previous reports of the prevalence of HBV and HCV infections in the general population of Lao PDR. Epidemiological data are necessary to determine the burden of disease that exists in the country. In order to estimate the seroprevalence of HBV and HCV infections in Lao PDR, a retrospective study of blood donors screened at the National Blood Transfusion Center, Lao Red Cross, Vientiane, from 2003 to 2005, was carried out. This report presents the results of screening for hepatitis B surface antigen (HBsAg) and hepatitis C antibody (anti-HCV) in this group of donors.

## MATERIALS AND METHODS

We analyzed the data from the National Blood Transfusion Center, Lao Red Cross, Vientiane, Lao PDR. The study population was composed of all first-time blood donors from January 2003 to December 2005. The donors were mainly recruited from the inhabitants of Vientiane municipality, Vientiane Province and Bolikhamsay Province (Fig 1), either by donation at the National Blood Transfusion Center, Lao Red Cross, Vientiane, or mobile collecting centers. Written records of the National Blood Transfusion Center were reviewed for donor age, gender, and the presence of HBsAg and anti-HCV.

HBsAg was screened for using the gela-

tin particle agglutination test SERODIA®-HBs (Fujirebio, Tokyo, Japan). Anti-HCV was screened for using the gelatin particle agglutination test SERODIA®-HCV (Fujirebio, Tokyo, Japan). Samples that were initially positive for HBsAg or anti-HCV were retested by enzyme immunoassay (EIA), MONOLISA® Ag HBs PLUS for HBsAg and MONOLISA® Anti-HCV PLUS Version 2 for anti-HCV. These were EIA kits from BIO-RAD (Marnes la Coquette, France). Samples that tested positive on repeat analysis were considered truly positive.

## Statistical analysis

A computerized data sheet was used for record keeping; all data were evaluated with SPSS 12.0 for Windows statistical software package (SPSS, Chicago, IL). Differences in prevalence, gender and age group were calculated using the  $\chi^2$ -test. A p-value of  $\leq 0.05$  was considered significant.

## RESULTS

From the total number of 13,897 first-time blood donors, 4,739, 4,345, and 4,813 were included in this study for the years 2003, 2004, and 2005, respectively. There were 10,099 males (72.7%) and 3,798 females (27.3%). All of whom were blood donors age 17-66 years, mean age  $22.4 \pm 7.0$  years. The subjects were mainly young people; 7,948 (57.2%), 4,371 (31.5%), 1,052 (7.6%), 430 (3.1%), and 96 (0.7%) fell within the age groups 17-20, 21-30, 31-40, 41-50 and 51-66 years old, respectively.

Among the 13,897 blood donors studied, 1,213 tested positive for HBsAg (8.7%). The prevalence among males (9.7%) was higher than in females (6.2%) ( $p < 0.001$ ). The mean age of HBsAg carriers was  $22.3 \pm 6.6$  years. HBsAg positive rates decreased with age from 8.5% to 7.3%,  $p = 0.04$ . The prevalence of HBsAg in each age group is shown in Fig 2. The HBsAg positive rates for the years 2003, 2004, and 2005 were 8.6%, 8.7% and

Lao People's Democratic Republic



Fig 1–The study areas in Lao People's Democratic Republic.

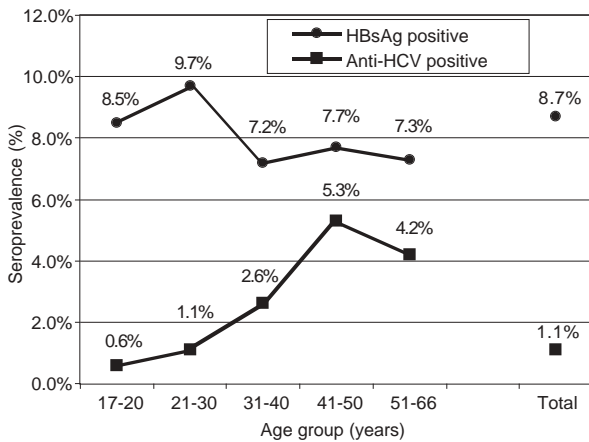


Fig 2–Seroprevalences of HBsAg and anti-HCV positive subjects by age group and among total samples.

8.9%, respectively. However, no statistical differences were found among the study years,  $p = 0.267$  (Table 1).

The overall rate of anti-HCV positive subjects from 2003 to 2005 was 1.1%. Anti-HCV positive subjects comprised 1.1% of the males

and 1.0% of the females ( $p = 0.86$ ), which shows no association between the seroprevalence of anti-HCV and gender. The mean age of anti-HCV positive subjects was  $28.7 \pm 10.7$  years. Anti-HCV positive rates increased with age, ( $p < 0.001$ ) (Fig 2). The anti-HCV positive rates for the years 2003, 2004 and 2005 were 1.0%, 1.1% and 1.1%, respectively, which were not statistically different ( $p = 0.704$ ) (Table 1).

Seventeen subjects (0.12%) had dual infection with HBV and HCV, 15 males (0.15%) and 2 females (0.05%).

DISCUSSION

Surveillance of carriers of viral hepatitis is essential to assess the burden of the disease in the population. Baseline disease levels need to be evaluated before starting any intervention strategy. This was the first population-based seroprevalence study of HBV and HCV infections in Lao PDR.

Table 1  
Seroprevalence of HBsAg and anti-HCV positive subjects, 2003-2005.

Year	First-time number of blood donors	HBsAg positive			Anti-HCV positive		
		N <sup>a</sup>	% <sup>a</sup>	p-value <sup>b</sup>	N <sup>a</sup>	% <sup>a</sup>	p-value <sup>b</sup>
2003	4,739	407	8.6	0.267	46	1.0	0.704
2004	4,345	380	8.7		48	1.1	
2005	4,813	426	8.9		54	1.1	
All	13,897	1,213	8.7		148	1.1	

<sup>a</sup>N = number of positive cases, % = percentage of positive cases

<sup>b</sup> $\chi^2$ -test of proportion from 2003 to 2005

There is a wide variation in HBV infection in the Asia-Pacific region, and many countries in this region have a high or intermediate level of endemicity except Singapore, Malaysia and Japan (Andre, 2000). Our results show the prevalence of HBsAg among Lao blood donors was 8.7%, therefore, Lao PDR belongs in the category of high endemicity. The prevalence among males (9.7%) was higher than females (6.2%) and the HBsAg positive rates decreased with age from 8.5% to 7.3%. These prevalence rates and patterns are similar to a previous report from northern Thailand (Jutavijittum *et al*, 1999).

In areas with a high endemicity of HBV infection, the most common route of transmission is perinatal, or the infection may be acquired during childhood. Useful methods for preventing and eradicating HBV infection included educating the general population regarding the disease and its transmission routes, and an effective vaccination program. The epidemiology of HBV infection has changed widely with time, as hepatitis B prevention programs have become effective. Many countries with successful vaccination programs have greatly reduced the incidence of HBV infection (Andre, 2000). Lao PDR was one of the first countries supported by the Global Alliance for Vaccines and Immunization (GAVI) and Vaccine Fund (VF) for the supply

of the combined diphtheria, pertussis, tetanus, and hepatitis B (DPT-HB) vaccine (WHO, 2003). The country introduced DPT-HB vaccines into the National Immunization Program in 2001, and was committed to strengthening outreach services and to increasing routine coverage to 80% by 2003. This target was overly ambitious and 80% coverage is unlikely before 2007. The World Health Organization and the United Nations International Children's Emergency Fund (UNICEF) have launched an initiative to promote injection safety called The Safe Injection Global Network (SIGN), which supports giving all immunization injections in Lao PDR using auto-disable (AD) equipment. The target was to have 100% of immunization injections given with AD syringes that are properly disposed of in safety boxes and effectively incinerated by 2005 (Ministry of Health, 2002; WHO, 2003).

About 80% of HCV infected people fail to clear the virus during the acute phase of the disease and become chronic carriers (WHO, 2000b). An anti-HCV positive result indicates a past or present infection, but does not differentiate between acute, chronic or past infection. Although limitations in the use of anti-HCV positive laboratory reports to conduct surveillance for chronic HCV infection exist, they can be an important source of national estimates of the proportion of people

with HCV infection. The overall rate of anti-HCV among first-time blood donors in Lao PDR from 2003 to 2005 was 1.1%. This value seems relatively low at first glance, however, it is suspected that most HCV infected people will progress to chronic hepatitis, liver cirrhosis or hepatocellular carcinoma in the future.

No vaccine is currently available to prevent hepatitis C, and treatment for chronic hepatitis C is too costly for most people in developing countries to afford. Thus, from a global perspective, the greatest impact on hepatitis C disease burden will likely be achieved by focusing efforts on reducing the risk of HCV transmission from nosocomial exposure (eg, blood transfusion, unsafe injection practices) and high-risk behavior (eg, injection drug use) (WHO, 2000b).

HBV and HCV infections are significant transfusion-transmissible infections. The transmission of viral hepatitis is minimized by screening donors prior to donation and the exclusion of high-risk donors, followed by the screening of donated blood for HBsAg and anti-HCV prior to transfusion (Lavanchy, 2002). Blood banks in Lao PDR have screened donated blood for HBsAg and anti-HCV as a routine procedure since 1993 and 2000, respectively.

In our study, dual infection with HBV and HCV was found in 0.12% of Lao blood donors. Although dual infection with HBV and HCV is not uncommon in the geographic areas where a high endemic level of both infections is reported, such as Southeast Asia and the Mediterranean, the role of this dual infection in the pathogenesis of chronic liver disease is still controversial (Ayoola and Gadour, 2004; Shi *et al*, 2005; Liu and Hou, 2006; Castillo *et al*, 2007).

Our findings indicate that Lao PDR is a country highly endemic for HBV infection (8.7%) and anti-HCV (1.1%). Since epidemiologic data are valuable for risk assessment,

further studies are needed to provide more details about the status of HBV and HCV infections in Lao PDR to determine the most feasible and useful approaches for establishing prevention activities.

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