



*Research article*

## **Prevalence and factors associated with chronic Hepatitis B infection among adults in the Central Highland, Vietnam**

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**Abstract:** Objective: The study was conducted to estimate the prevalence of chronic hepatitis B infection and related factors among adult population in Central Highland, 2018. Methods: The study applied the cross-sectional descriptive design with the combination of structured interview and serological blood tests. There were 2428 respondents in 03 provinces, namely Kon Tum, Gia Lai, Dak Nong included in the study which was conducted from September to December 2018. Results: The prevalence of hepatitis B infection among adults in Central Highland was 11.2% with the positive uniformity among provinces in the region. The findings also showed that male adults, farmers and those who have relatives with liver disease and experienced the kidney dialysis possessed a higher rate of hepatitis B virus infection than the one of other groups. The findings also showed that the respondents had a low uptake of the vaccine among infected group (6.3%). Study subjects with vaccination were less affected by hepatitis B virus infection rate than the ones without vaccination. Conclusions: The high prevalence of chronic hepatitis B in the Central Highland indicates that it needs much more attention of Ministry of Health and local authorities for prevention of infection through mother-to-child transmission and early infection due to late immunization and more rescue investment for diagnostic, evaluation, follow up and treatment of people with chronic

HBV infection. The consideration regarding occupations, family history of liver diseases is also required for during the intervention implementation.

**Keywords:** chronic Hepatitis B; prevalence; associated factors, Central Highland; Vietnam

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## 1. Introduction

Hepatitis is a common infectious disease that causes serious health consequences and put people at high risk of death such as acute liver failure, cirrhosis and liver cancer. Among the 5 types of hepatitis virus, the hepatitis B virus has been considered as the one with the greatest impact on human health. According to the estimates by World Health Organization (WHO) in 2015, there are about 257 million cases of chronic hepatitis B [1]. The estimated number of deaths caused by hepatitis B is approximately 1.4 million per year. The hepatitis B virus is the leading cause of liver cancer, with an estimated 57% of cirrhosis cases and 78% of primary liver cancers caused by hepatitis B infection. According to the results of global health burden research in 2013, hepatitis was the 7<sup>th</sup> leading cause of death [1].

Vietnam is one of the countries with high rates of hepatitis B infection in the Southeast Asia and has suffered from the serious consequences caused by this disease [2]. The results of the disease burden estimation model in 2017 which was implemented by the Ministry of Health and WHO showed that the prevalence of hepatitis B infection in Vietnam is from 6% to 20% [3]. Another study showed that by 2025, Vietnam will have approximately 7.8 million people infected with chronic hepatitis B virus and there will be about 40,000 deaths related to hepatitis B [4]. Hepatitis B vaccination was piloted in Vietnam since 1998 and was integrated into the national expanded program on immunization in 2002. The birth dose was also implemented since 2003 [5]. A national survey conducted in 2011 also showered the evidence that the high vaccination coverage can reduce the prevalence of chronic hepatitis B infection [5].

In the Central Highland, there were no comprehensive studies on this issue. The information and data scarcity regarding on the status of hepatitis B virus infection creates intervention limitations tackling this kind of infection. From this fact, this study aims to determine the prevalence and identify factors associated with hepatitis B virus infection among adults in the Central Highland, Vietnam. The findings will provide scientific evidence for policy makers at national and provincial levels for improving the quality of public health policies in Hepatitis B disease prevention and control in Vietnam.

## 2. Methods

### 2.1. Study setting and population

The study was implemented from September to December 2018 in Central Highland's provinces, Vietnam including Kon Tum, Gia Lai and Dak Nong. The three ones have similar economic, social, cultural, geographical and ethnic conditions. Study population are the residents from 18 years old (born before 2001) living permanently in the study setting more than 1 months before the time of conducting the study.

## 2.2. Sampling methods

The study applied the cross-sectional design with quantitative data collection method. The sample size was calculated by the following equation with the guidance of World Health Organization (WHO) [6]. The total number of research sample size in 3 provinces was 2430. In each selected province, 3 districts were randomly selected by the simple random method. Each district has  $810/3 = 270$  respondents. Based on the list of all communes in each district selected, the research team randomly selected 3 communes using a single random sampling method. Each commune has  $270/3 = 90$  people. In each commune, based on the results of the household information collection, members were eligible to participate in the study by using “Kish method” [7]. The expected number of respondents was 2430 subjects, but two among all study subjects had unspecified test results, so the final sample size was 2428.

## 2.3. Data collection

Data collection methods in the study include:

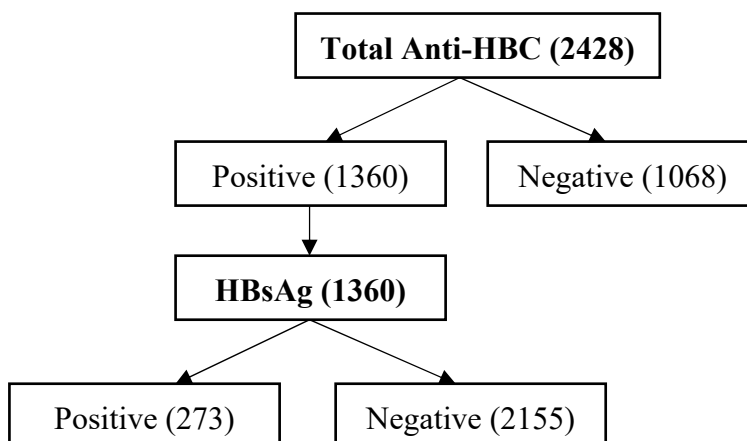
(1) Select individuals in the households participating in the study.

(2) Interview with a structured questionnaire: This questionnaire was designed with around 70 questions related to the demographic and sociological characteristics, history of medical examination and treatment and risk behaviors of respondents. The questionnaire was piloted with 90 respondents in 3 provinces to be finalized before the official survey.

(3) Testing for the hepatitis B virus: Each respondent was taken an amount of 5 ml of intravenous blood by a testing officer of the Provincial Centers for Disease Control. Serum was separated from venous blood after centrifugation. After that, the blood sample is transported to the Central Highland Institute of Hygiene and Epidemiology for storage and then transfer for testing at the microbiological laboratory of Bach Mai Hospital by Chemiluminescent Microparticle Immunoassay (CMIA) method on Abbott Architect machine system. This testing system was accredited ISO 15189:2007 that meets the international standards for laboratory. All samples were tested for total antibody against the core antigen of hepatitis B virus (Total anti-HBc) by using ARC Anti-HBc II Reagent kit. Samples positive for total anti-HBc will test for HBsAg by using ARC HBsAg II Reagent kit to identify the status of chronic Hepatitis B infection according to the technical guidance of Hepatitis B testing released by Vietnam Ministry of Health (Decision 4283/QD-BYT dated 08/08/2016). Among 2428 respondents, 1360 got positive Total Anti-HBc. After testing HBsAg, 273 out of these 1360 respondents were positive which mean they got chronic hepatitis B infection.

## 2.4. Variables

Dependent variable: Chronic Hepatitis B infection status. Independent variables: (1) Demographic and sociological characteristics: age, gender, ethnicity, education, marital status, occupation; (2) History of medical examination and treatment: status of liver disease of relatives, surgery and procedures, receiving and giving blood, abortion; (3) Risk behaviors: smoking, alcohol use, sharing razors, sharing toothbrushes, blood transfusion, sexual activities.



**Figure 1.** Hepatitis B virus testing procedure.

### 2.5. Data entry and analysis

All completed interviews and test results for hepatitis B were double-checked using Epidata Entry 3.1. Stata 15.0 software was used to analyze the data with the development of tables describing the prevalence of hepatitis B virus, risk behaviors and associated factors. Univariate and multivariate logistic regression were performed to analyze the association with the rate of hepatitis B infection with independent variables with significance level of  $p = 0.05$  and 95% confidence interval. The statistically significant variables in univariate analysis were included in the multivariate model to find out the association with chronic hepatitis B infection.

### 2.6. Ethics approval of research

This study was Ethics approved by the review board of National Institute of Hygiene and Epidemiology, Vietnam. The individuals were interviewed after being informed about the objectives of the study, the assurance of data confidentiality and the approval of the informed consent form.

## 3. Results

### 3.1. General characteristics of the respondents

A total 2428 respondents were in the study, male accounted for 46.9% while female accounted for 53.1%. About 60% of the study respondents were Kinh ethnic group (the most important ethnic group in Vietnam), the remaining 40% belonged to other ethnic groups. The age group 30–39 years old accounted for the highest percentage (28.1%) and the lowest one belongs to age group  $\geq 60$  years old (10.7%). The research data also shows that the most respondents have educational level of high school (90.8%). Most of the respondents were also married (85.8%). And their main occupation is the farmer (75.5%) (Table 1).

**Table 1.** General characteristics of the respondents.

Characteristics	n	%
Gender		
Male	1139	46.9
Female	1289	53.1
Ethnic		
Kinh	1469	60.5
Others	959	39.5
Age		
<30 years old	411	16.9
30–39 years old	684	28.1
40–49 years old	655	27.0
50–59 years old	419	17.3
≥60 years old	259	10.7
Educational level		
High school and below	2205	90.8
College and above	223	9.2
Marital status		
Single	387	14.2
Married	2341	85.8
Occupation		
Farmer	1832	75.5
Others	596	24.5

### 3.2. Risk behaviors of the respondents

Regarding the risk behaviors, different kinds of substance use were detected among the respondents: 21.4% smoked and 12.4 consumed alcohol. 10.5% respondents were experienced ear piercing or tattooed. Some reported they had shared their hair razors (15.1%) and toothbrushes (6.3%) with others. The number of respondents experienced kidney dialysis and blood transfusion were low (0.5% and 2.1% respectively). Only 14.4% of them used condom in the last sexual intercourse over the recent month (Table 2).

**Table 2.** Risk behaviors of the respondents.

Risk behaviors	n	%
Smoking	520	21.4
Alcohol use	301	12.4
Shared hair razor	367	15.1
Condom used at the last sexual intercourse over the recent month	222	14.4
Shared toothbrushes	152	6.3
Blood transfusion	52	2.1
Kidney dialysis	12	0.5

### 3.3. Prevalence of hepatitis B virus infection

The prevalence of hepatitis B infection in 3 provinces in the Central Highland at the time of the study was 11.2%. Dak Nong accounted for the highest infection rate at 11.7%, the second one was Kon Tum with 11.6% and the lowest one was Gia Lai with 10.4% (Table 3).

**Table 3.** Chronic hepatitis B virus infection status of respondents.

Chronic hepatitis B	Dak Nong		Kon Tum		Gia Lai		Central Highland	
	n	%	n	%	n	%	n	%
Yes	95	11.7	94	11.6	84	10.4	273	11.2
No	715	88.3	716	88.4	724	89.6	2155	88.8

### 3.4. Associated factors

Among demographic and sociological factors, there are several ones identified as being associated to the chronic hepatitis B infection of people in the Central Highland. Men had a positive rate 1.37 times higher than women (OR = 1.37, 95% CI = 1.06–1.77). Respondents <50 years old had a positive rate 1.88 times higher than respondents ≥50 years old (OR = 1.88, 95% CI = 1.37–2.60). Farmers had an infection rate higher than 1.51 times as much as other professions (OR = 1.51, 95% CI = 1.09–2.09).

Regarding the medical history factors, having relatives with liver disease and experiencing kidney dialysis of respondents were found to be associated with chronic hepatitis B infection. Accordingly, the study subjects having relatives with liver diseases were 2.15 times higher than those having relatives without liver diseases (OR = 2.15, 95% CI = 1.47–3.15). In addition, respondents who have undergone dialysis for kidney disease are also counted as relevant factor with a positive rate up to 3.99 times higher than those who have not undergone dialysis (OR = 3.99, 95% CI = 1.19–13.34). The results also showed that respondents had a low uptake of the vaccine among infected group (6.3%) and the vaccinated group was 4.3 times less likely to be infected than the ones who have not been vaccinated (OR = 0.51, 95% CI = 0.29–0.86).

In the regression model, men were more likely to get chronic hepatitis B infection than women (OR = 1.36, 95% CI = 1.05–1.77), farmers were more likely to get chronic hepatitis B virus infection than other occupation groups (OR = 1.86, 95% CI = 1.33–2.61). <50 years old respondents were

more likely to get chronic Hepatitis B virus infection than  $\geq 50$  years old respondents (OR = 1.86, 95% CI = 1.33–2.61). Respondents with kidney dialysis experience were more likely to get chronic Hepatitis B infection than the ones without this kind of experience (OR = 4.09, 95% CI = 1.17–14.34). The respondents who received the hepatitis B vaccine had a lower tendency to get hepatitis B infection than the group who did not (OR = 0.66, 95% CI = 0.51–0.87) (Table 4).

**Table 4.** Univariate and multivariate analyses of factors associated with HBV infection.

Factors	n	%	OR	95%CI	p-value	AOR	95%CI	p-value
<b>Gender</b>								
Male	147	12.9	1.37	1.06–1.76	0.015*	1.36	1.05–1.77	0.021*
Female	126	9.8	1			1		
<b>Ethnic</b>								
Kinh	169	11.5	1.07	0.83–1.39	0.615			
Others	104	10.8						
<b>Age</b>								
<50 years old	224	12.8	1.88	1.37–2.60	0.011*	1.86	1.33–2.61	0.001*
$\geq 50$ years old	49	7.2				1		
<b>Occupation</b>								
Farmer	223	12.2	1.51	1.09–2.09	0.011*	1.71	1.22–2.41	0.002*
Others	50	8.4				1		
<b>Relatives with liver diseases</b>								
Yes	38	20.3	2.15	1.47–3.15	0.001*	1.97	1.33–2.92	0.001*
No	228	10.6				1		
<b>Kidney dialysis experience</b>								
Yes	4	33.4	3.99	1.19–13.34	0.015*	4.09	1.17–14.34	0.028*
No	269	11.1				1		
<b>Blood transfusion</b>								
Yes	8	15.4	1.44	0.67–3.09	0.350			
No	264	11.2						
<b>Undergone dental procedure</b>								
Yes	97	11.2	0.99	0.77–1.29	0.972			
No	176	11.3						
<b>HBV vaccination</b>								
Yes	15	6.3	0.51	0.29–0.86	0.011*	0.66	0.51–0.87	0.004*
No	258	11.8				1		
<b>Tattoo</b>								
Yes	29	11.4	1.02	0.68–1.54	0.926			
No	244	11.2						

*Continued on next page*

Factors	n	%	OR	95%CI	p-value	AOR	95%CI	p-value
Shared hair razor								
Yes	12	10.9	0.97	0.52–1.78	0.909			
No	261	11.3						
Shared tooth brusher								
Yes	11	7.2	0.60	0.32–1.12	0.106			
No	262	11.5						
Alcohol use								
Yes	30	9.9	0.85	0.55–1.29	0.454			
No	243	11.4						

\* Significant at  $\alpha = 0.05$ .

#### 4. Discussion and conclusion

The results showed that the rate of chronic hepatitis B infection in three Central Highlands provinces is high (11.2%) compared to the region and the world. A study using data from 120 countries overt the world, the chronic hepatitis B prevalence was only 3.6% [8]. With the rate mentioned previously, 3 study provinces in the Central Highland were classified as high endemic areas ( $\geq 8\%$ ) [9]. In Thailand, a country has similar economic and social characteristics with Vietnam, the percentage of people infected by hepatitis B was only 3.0% [10]. However, compared to previous studies in some provinces or regions such as Hanoi (15–25%), Lam Dong (16.7%), Binh Thuan (17.7%), and provinces of Central Coast (12.8–19.7%) [11–15], the positive rate of the three provinces in the Central Highlands is lower. It is also important to note that the proportion in this study is only calculated for the adult population ( $\geq 18$  years) but there are no calculated data for the target group of children ( $< 18$  years). The study results also indicate that there was not much difference between the prevalence of hepatitis B virus infection in the three selected provinces. This also shows the similarity in the circulation of hepatitis B virus in the community in the Central Highland. Besides, screening in the general population in countries/generations with high prevalence is recommended by WHO. The surveys in adults should be primarily conducted to determine the needs for diagnostic, evaluation, follow up and treatment. Thus, this study's findings also help determine the feasibility of screening in population in Tay Nguyen.

Among the demographic, gender, age and occupation are the factors related to the prevalence of hepatitis B virus infection in Central Highland. Studies have shown that men have a higher positive rate than women and this result is consistent with data in the three Central Highland provinces [11,12]. One the major reasons is that in Vietnam, men often experiences high-risk behaviors for the transmission of hepatitis B virus (smoking, alcohol use, unsafe sex) and with a tendency to access health services at serious health status [16]. Respondents who are  $\geq 50$  years old having lower rate of chronic Hepatitis B infection than younger ones, was the interesting finding of this study. It may be explained by the death of patients  $\geq 50$  years old with complications could reduce the number of infected individuals were still alive. This hypothesis was also supported by the evidence from a previous study [17]. In addition, occupational factors are also mentioned in some studies and have similarities with results obtained in the three Central Highland provinces when showing a high positive rate among farmers, such as research in Thua Thien Hue [13]. Farmers have



a higher rate of hepatitis B infection than other occupational groups because this group often has limited and difficult access to health services related to hepatitis B prevention including vaccination and health education communication activities. Some other factors such as age, marital status or ethnic groups, were found to be associated with hepatitis B infection in previous studies but were not found in this study [18–20].

For the medical history group, a family history of liver diseases and kidney dialysis experience were found as the factors that were associated with the infection of chronic hepatitis B. Similar results have been found in previous studies, and this is especially true for countries with high endemic prevalence such as Vietnam [21,22]. Several other factors that contribute evidence in previous studies such as each surgery, dental procedure, tattooing, sharing razors, brushes and sexual activities were not found in this study [9].

In addition, the study also provided evidence that the vaccinated group had lower rates of hepatitis B virus infection than the unvaccinated group. This once again confirms the role and significance of vaccines in the prevention of hepatitis B. Thereby, Vietnamese health sector needs to pay more attention and adjust interventions by enhancing the effectiveness of mother-to-child transmission prevention, early infection due to late immunization and diagnostic, evaluation, follow up and treatment of people with chronic HBV infection. The interventions also need consideration to put the men and farmer as prioritized groups. In addition, maintaining and enhancing the effectiveness of the hepatitis B vaccination program is also a recommendation from the research results.

This study also had limitations. We just conducted the study on the general population and did not focus on the specific groups with high risk of hepatitis B infection such as sexual workers or injecting drug users. Besides, we also did not gather the information of the vaccine process (age of immunization and the follow-up). These are suggestions for upcoming studies related to this topic in the future.

### Conflicts of interest

All authors declare that there is no conflict of interest.

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