Hepatitis B infection among adults in the Philippines: A national seroprevalence study

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Abstract

AIM: To determine the prevalence of hepatitis B surface antigen (HBsAg) seropositivity among adult Filipinos.

METHODS: Testing for HBsAg was performed on serum samples from persons aged ≥ 20 years old who participated in the National Nutrition and Health Survey (NNHeS) conducted in 2003. Information on age, sex, marital status, educational attainment, employment status, and income were collected. For this study, marital status was classified as never married or otherwise (i.e., married, divorced, separated, widowed); educational attainment was classified as high school graduate or below or at least some tertiary education; and employment status was classified as currently employed or currently unemployed. Annual income was divided into 4 quartiles in Philippine pesos (PhP): Q1, ≤ PhP 53064; Q2, PhP 53065-92192; Q3, PhP 92193-173387; and Q4, ≥ PhP 173388. Prevalence estimates were weighted so that they represented the general population. Social and demographic factors were correlated with HBsAg seropositivity. Multivariate analysis was used to determine independent predictors of HBsAg seropositivity.

RESULTS: A total of 2150 randomly selected adults, 20 years and over, out of the 4753 adult participants of NNHeS were tested for HBsAg. The HBsAg seroprevalence was 16.7% (95% CI: 14.3%-19.1%), which corresponded to an estimated 7278968 persons infected with hepatitis B. There was no significant difference between males and females (17.5% vs 16.0%; P = 0.555). This corresponded to an estimated 3721775 men and 3557193 women infected with hepatitis B. The HBsAg seroprevalence peaked at age 20-39 years old, with declining prevalence in the older age groups. The only independent predictor of HBsAg seropositivity was the annual income, with persons in the highest income quartile being less likely to be HBsAg positive (age-adjusted OR = 0.51; 95% CI: 0.30-0.86) compared to subjects in the lowest income quartile. Sex, marital status, educational attainment, and employment status were not found to be independent predictors of HBsAg seropositivity.

CONCLUSION: The high HBsAg seroprevalence among adults in the Philippines classifies the country as hyperendemic for HBV infection and appears unchanged over the last few decades.
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**Key words:** Prevalence; Hepatitis B; Survey; Philippines; Asia

**Core tip:** Chronic hepatitis B has a significant public health impact in the Philippines because it is a common cause of end stage liver disease and is the leading cause of hepatocellular carcinoma, the latter being the fourth leading cancer and the second leading cause of cancer death in the country. However, an accurate estimate of the national prevalence of hepatitis B infection in the Philippines is lacking. To determine the national prevalence of hepatitis B infection in the Philippines, testing for hepatitis B surface antigen was undertaken on serum samples collected from subjects included in the National Nutrition and Health Survey.

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**INTRODUCTION**

Chronic hepatitis B (CHB) remains to be a significant public health burden affecting 400 million people worldwide, and is most prevalent in the Asia Pacific region[6]. The disease is estimated to account for 30% of cirrhosis and 53% of hepatocellular carcinoma (HCC) cases worldwide. As such, it is responsible for a staggering half a million deaths every year from hepatitis B virus (HBV)-related cirrhosis and HCC[7].

The Philippines is considered an endemic country for hepatitis B. Chronic hepatitis B has a significant public health impact in the Philippines because it is a common cause of end stage liver disease and is the leading cause of HCC[3,4], the latter being the fourth leading cancer and the second leading cause of cancer death in the country[5]. However, an accurate estimate of the national prevalence of hepatitis B infection in the Philippines is lacking. Although many prevalence studies have been done earlier, they either included small sample sizes, or were done only in select populations (i.e., overseas employment applicants, certain ethnic groups, limited locality, institutional, etc)[6-9]. Accurate prevalence estimates in the general population are important in the control of HBV infection and its complications, and may especially be instrumental in shaping health policies on primary and secondary prevention of this infection.

To determine the national prevalence of hepatitis B infection in the Philippines, testing for hepatitis B surface antigen (HBsAg) was undertaken on serum samples collected from subjects included in the National Nutrition and Health Survey (NNHeS).

**MATERIALS AND METHODS**

**NNHeS and data collection**

NNHeS was conducted in 2003 as a collaborative effort among the Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST), the department of health, and fourteen medical specialty associations in the country. The NNHeS was conducted in conjunction with the 6th National Nutrition Survey of the FNRI-DOST. The study protocol was approved by the Technical Committee and Ethical Review Board of the DOST. Studies on the prevalence and risk factors of atherosclerosis-related diseases and metabolic syndrome have been published using the data from the survey[10,11].

The survey utilized the National Statistics Office Master Sample with household listing taken from the Family Income and Expenditure Survey. A stratified multi-stage sampling design was employed to represent each of the 17 regions in the country. The sampling method utilized the “Barangay” which is the basic political unit in the Philippines that serves as the primary planning and implementing unit of government policies and programs and which is created out of a contiguous territory with at least 2000 inhabitants[10]. The first stage involved the selection of the Primary Sampling Units (PSUs) in a barangay or contiguous barangays with at least 500 households with probability proportional to the estimated number of households. The second stage involved selection of Enumeration Areas (EAs) within sampled PSUs with 150-200 households serving as the Secondary Sampling Units. The last stage was the selection of housing units within the sampled EAs which served as the ultimate sampling unit. As such, the household was considered as a cluster in which all the units became part of the survey. The clinical component of the NNHeS covered only one of the four replicates of the Master Sample and 25% of the households. A replicate was a sub-sample that possessed the properties of the full master sample such that each replicate was able to generate national level estimates of adequate precision. Adults 20 years and over served as participants of the study.

Information on age, sex, marital status, educational attainment, employment status, and income were collected. For this study, marital status was classified as never married or otherwise (i.e., married, divorced, separated, widowed); educational attainment was classified as high school graduate or below or at least some tertiary education; and employment status was classified as currently employed or currently unemployed. Annual income was divided into 4 quartiles in Philippine pesos (PhP): Q1, ≤ PhP 53064; Q2, PhP 53065-92192; Q3, PhP 92193-173387; and Q4, ≥ PhP 173388 according to categories of income used in a World Health Organization publication on non-communicable diseases and socioeconomic inequalities[15].

**Laboratory methods**

HBsAg testing was performed on serum samples col-
The high HBsAg seroprevalence in the Philippines in 2003 is in contrast to other countries in the Asia Pacific.
The continued high HBsAg seroprevalence probably explains why the yearly incidence of HCC for both males (20-21 per 100000) and females (7-8 per 100000) in the Philippines has not changed over the past 20 years[20]. The burden of CHB infection expectedly spills over into the public health arena because of the high cost of taking care of one patient with CHB. In Asia, the cost can range from United States Dollar 185-1321 per year for patients with compensated CHB-related cirrhosis, to United States Dollar 49000-66000 for every CHB patient needing a liver transplant[21,22]. In countries like the Philippines where there is very little government assistance for healthcare, the cost for CHB care falls squarely on the shoulders of the patients themselves. Therefore, the finding that persons in the lower income brackets are more likely to be infected with HBV makes the impact of this infection on the utilization of healthcare resources in the Philippines even more significant.

Our study has several limitations. We did not include adults younger than 20 years old and children. Thus, the current estimate may consequently not be reflective of the true national HBsAg seroprevalence. However, while universal infant HBV vaccination was first introduced into the national immunization program as early as 1992[15], due to insufficient funds, the program was never fully implemented until January 2007[19]. Therefore, since fully funded efforts to curb the perinatal transmission of HBV started only after the study was made, the HBsAg seroprevalence of adults younger than 20 years old and children is not expected to be very different from the estimates in this study. A study evaluating the seroprevalence of HBV in children is needed and is expected to be conducted in the immediate future as the Philippines together with countries in the World Health Organization Western Pacific Region have adopted a region-wide goal to reduce the seroprevalence of HBV in children 5 years old.

Table 2  Prevalence of hepatitis B surface antigen seropositivity and population estimates according to age group and gender n (%)  

| Age group | Total | 95% CI | Estimated number | Males | 95% CI | Estimated number | Females | 95% CI | Estimated number |
|-----------|-------|--------|-----------------|-------|--------|-----------------|---------|--------|-----------------|
| 20-29     | 329 (18.1) | 13.6-22.6 | 2580340 | 170 (19.5) | 13.1-25.9 | 1392647 | 159 (16.6) | 10.5-22.8 | 1187693 |
| 30-39     | 314 (17.6) | 13.2-22.0 | 1960314 | 163 (20.2) | 13.6-26.8 | 1137688 | 151 (14.9) | 9.0-20.7 | 822626 |
| 40-49     | 252 (16.0) | 11.2-20.9 | 1314240 | 112 (13.4) | 7.2-19.7 | 567308 | 140 (18.2) | 11.4-25.1 | 746932 |
| 50-59     | 162 (14.3) | 9.0-19.5 | 715781 | 66 (10.1) | 3.2-16.9 | 265155 | 96 (17.2) | 9.3-25.0 | 450626 |
| 60-69     | 638 (14.3) | 11.4-17.2 | 443882 | 267 (17.6) | 12.7-22.6 | 254760 | 371 (19.9) | 8.3-15.5 | 189122 |
| 70 and over | 455 (13.6) | 10.0-17.3 | 264411 | 178 (12.4) | 8.1-16.8 | 104217 | 277 (14.4) | 9.5-19.2 | 160394 |

region where the latest estimates show that the prevalence of HBV infection has already fallen below previous estimates. In Northeast China and South Korea, recent seroprevalence surveys indicate a two- to threefold decrease in HBsAg seroprevalence in the last 1-2 decades[13,14]. Both countries adopted universal infant vaccination and attributed the declines in HBsAg seroprevalence to the effect of vaccination programs. The current study did not include adults younger than 20 years old and children. Thus, it is not possible to make a complete assessment of the effectiveness of the universal infant vaccination program that was introduced in 1992[13].

The highest prevalence of HBV infection is seen in the 20-39 year-old age group with decreasing HBsAg seroprevalence in the older age groups. This trend is similar to data from other countries in the Asia-Pacific region. While this may be due to older patients with HBV infection dying from cirrhosis and HCC, there is also evidence that even in countries where the predominant mode of HBV transmission is perinatal, HBsAg seroclearance can occur in up to 28% of CHB patients by the time they reach 60 years of age, with a median age of 48 years at the time of HBsAg seroclearance[16]. A lower annual income was the only independent predictor of HBsAg seropositivity in our study, and may reflect inequity in the access to health care, including preventive programs such as vaccination, among the different socioeconomic levels. This is not surprising since studies have shown that patients with lower socioeconomic status are more likely to have delayed and missed vaccinations[17], and are more likely to be ignorant of how HBV is transmitted[18]. Moreover, it is also important to note that a low educational status was associated with a higher HBsAg seroprevalence on univariate analysis. The results of the study highlights the importance of a government-subsidized immunization program and a grassroots HBV education program in a nation where the poverty level still hovers around 27%/19.

Table 3  Relative odds of hepatitis B surface antigen positivity among adults by selected demographic variables  

| Variable | Adjusted OR | 95% CI |
|----------|-------------|-------|
| Sex      |             |       |
| Females  | 1.00        |       |
| Males    | 1.06        | 0.76-1.45 |
| Marital status |          |       |
| Never married | 1.00   |       |
| Otherwise | 0.75        | 0.48-1.16 |
| Educational attainment |         |       |
| High school | 1.00     |       |
| At least some tertiary | 0.78 | 0.55-1.13 |
| Employment status |       |       |
| Unemployed | 1.00      |       |
| Employed  | 1.18        | 0.85-1.71 |
| Income   |             |       |
| Q1       | 1.00        |       |
| Q2       | 0.94        | 0.59-1.50 |
| Q3       | 0.82        | 0.51-1.31 |
| Q4       | 0.51        | 0.30-0.86 |
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