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Factors Associated with Hepatitis B Knowledge Among Vietnamese Americans: A Population-Based Survey

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Abstract Vietnamese Americans have high rates of hepatitis B virus (HBV) infection but low rates of knowledge and screening. A population-based survey conducted in 2011 of Vietnamese Americans in two geographic areas (n=1666) was analyzed. The outcome variables were having heard of HBV and a score summarizing knowledge of HBV transmission. Most respondents (86.0%) had heard of HBV. Correct knowledge of transmission ranged from 59.5% for sex, 68.1% for sharing toothbrushes, 78.6% for during birth, and 85.0% for sharing needles. In multivariable analyses, factors associated with having heard of HBV and higher knowledge included Northern California residence, longer U.S. residence, higher education, family history of HBV, and discussing HBV with family/friends. Higher income was associated with having heard of HBV. English fluency and being U.S.-born were associated with higher knowledge. Interventions to increase knowledge of

HBV transmission are needed to decrease this health disparity among Vietnamese Americans.

Keywords Hepatitis B · Asian American · Vietnamese American · Liver disease · Health disparities

Introduction

Approximately 350 million people worldwide and 1.2 million Americans have chronic hepatitis B (HBV) infection [1]. Those infected have higher risks of developing liver disease and liver cancer [2], with 780,000 dying worldwide annually from related complications [3]. While there are effective medications to control HBV [4], prevention remains a key public health goal.

Vietnamese Americans disproportionately suffer from HBV. Up to 83.3% have been exposed [5] compared to 3.8% of the general population [6], and Vietnamese Americans accounted for 11.0% of chronic HBV cases [7]. The liver cancer incidence rate among Vietnamese Americans is six times that of non-Hispanic whites [8].

HBV screening is an essential part of the strategy to reduce HBV-related health problems. The CDC recommends screening among those born in endemic countries such as East and Southeast Asia, those who are U.S.-born but not vaccinated at birth and have at least one parent from an endemic country, and those who live with an infected person [9]. HBV vaccination is recommended for all those ages 0–18 years and at-risk adults, such as household contacts. In order to assess risk and to get screened and vaccinated appropriately, Asian Americans need know about HBV and its transmission.

Studies have examined awareness about HBV as well as rates of HBV testing and vaccination among Vietnamese

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Americans [8, 10–16]. One study reported that 80.8% of participants had heard of HBV but only 67.4% had been screened [15]. Another study with Vietnamese and Cambodian Americans found that only 60.2% reported having been screened and 34.7% vaccinated [17]. Knowledge gaps about HBV transmission and prevention can create barriers to screening, vaccination, and treatment [15, 16, 18]. Lack of knowledge about routes of HBV transmission remains a challenge in reducing its incidence [14, 16]. HBV can be transmitted through sexual contact with an infected person, by sharing needles or syringes, or from an infected mother to her infant at birth. HBV is not spread through breastfeeding, contaminated food or water, sharing eating utensils, hugging, kissing, holding hands, coughing, or sneezing [11, 12, 14, 16, 19].

Vietnamese Americans also have significant barriers to quality healthcare, including limited English proficiency and low health literacy. Based on the Health Behavior Framework [20], this study analyzes individual, healthcare system, and support factors on HBV-related knowledge among Vietnamese American adults, which in turn can impact behavior. Identifying factors that impact knowledge about HBV, particularly routes of HBV transmission, can inform future efforts to promote control and elimination of HBV.

Methodology

Study Design

This study is a population-based telephone survey with Vietnamese American participants age 18–64 and living in five counties in Northern California and nine counties in Washington, DC/Maryland/Virginia. The survey was conducted following a multimedia health education campaign in Northern California, which aimed to increase rates of HBV screening and vaccination. The University of California, San Francisco, University of California, Berkeley, and San Francisco State University Institutional Review Boards approved this study. Detailed information about survey design and implementation is described elsewhere [16].

Using a list of 55 common Vietnamese surnames that account for greater than 95% of the Vietnamese population [21], a professional sampling company provided a list of all potentially eligible residential phone numbers in the surveyed areas. Participants were eligible if they spoke Vietnamese or English and if they self-identified as Vietnamese, Vietnamese American, or Vietnamese Chinese. To determine eligibility, a minimum of 12 calls was made. In attempting to reach an eligible respondent, each telephone number was tried up to 25 times. Out of 12,063

numbers, 4476 (37.1%) were eligible, of which 1766 (39.5%) refused to participate and 1666 (37.2%) completed the survey. There were 3768 (31.4%) ineligible numbers (non-working, cellular telephone, business/government, not eligible due to ethnicity, age, or language, not in study area, or other). The overall cooperation rate, calculated as the number of completed interviews (at least 75% of items completed) divided by the number of completed interviews plus refusals was 48.5% (54.6% for Northern California and 43.4% for Washington, DC/Maryland/Virginia).

The final survey, available in Vietnamese and English, included 154 programmed items and averaged 24 min to complete. The computer-assisted telephone interviewing (CATI) survey was pre-tested with 45 individuals, who were included in the final sample because there were no changes after the pilot testing. The 1666 CATI interviews were conducted between February 11, 2011 and June 15, 2011.

Study Variables

Sociodemographic variables included: age, gender, marital status, geographic area of residence, highest level of education, employment status, annual household income, birthplace (U.S.-born vs. foreign-born), years lived in the U.S. (≤ 10 or >10 years), and English-language fluency. Health and healthcare access variables included: family history of HBV, having health insurance, having a regular place to go when sick, having a regular doctor, ethnicity of regular doctor, having seen a doctor in the last 12 months, and having had a HBV blood test. Communication variables included: if the participants' doctor had recommended a HBV blood test and if participants had discussed HBV with family or friends.

HBV knowledge was measured in two ways. One was a survey question regarding whether or not participants had heard of HBV, defined as the participant reporting having heard anything about a disease or infection called hepatitis B. The second was a composite score based on eight questions regarding knowledge of routes of HBV transmission by: (1) smoking cigarettes (false); (2) sneezing or coughing (false); (3) sharing food, drink, or eating utensils (false); (4) sharing toothbrushes (true); (5) reusing or sharing needles (true); (6) childbirth (true); (7) sexual intercourse (true); and (8) an infected person even if he/she looks and feels healthy (true). The transmission knowledge score summed the number of items the participant answered correctly (range 0–8). A composite knowledge score based on such survey questions has been described in previous work [15, 16].

Statistical Analysis

The two areas of residence were compared statistically with *t* tests for continuous variables and Chi square tests for categorical variables. A logistic regression model was used to assess the contribution of sociodemographic, health status and healthcare access, and communication variables to having heard of HBV. A linear regression model was employed to assess the contribution of sociodemographic, health status and healthcare access, and communication variables to the composite knowledge score regarding HBV transmission. Statistical significance was determined at the 0.05 level. Stata 13.0 [22] was used to analyze the data.

Results

Table 1 shows the sociodemographic characteristics of the 1666 participants in total and by area of residence. The mean age was 47.6 years [standard deviation (SD)=11.6], 58.4% were female, and 78.1% were married/had a partner. Most (97.6%) were born outside of the U.S.; 79.7% had lived in the U.S. for more than 10 years. Sixty eight percent of participants spoke English less than well. Most (81.2%) had health insurance, while 70.1% had a regular doctor. Only 17.9% had a family history of HBV infection and three-quarters (73.3%) reported that they had had a HBV blood test. There were significant differences between the Northern California and Washington, DC area participants in terms of sociodemographic characteristics, health status and healthcare access factors, and communication variables.

Table 2 shows HBV-related knowledge. Most participants (86.0%) had heard of HBV. Knowledge about routes of HBV transmission was moderate, with 85.0% knowing that HBV *could* be transmitted by sharing needles, 68.1% by sharing toothbrushes, 78.6% by childbirth, 69.8% by people who are infected even if they look and feel healthy, and 59.5% by sexual intercourse. Only half knew that HBV *could not* be transmitted by smoking cigarettes (50.4%) or by someone who coughs or sneezes (52.1%). Fewer participants knew that HBV could not be transmitted by sharing food or eating utensils (35.6%). The mean average transmission knowledge score (range 0–8) was 5.0 (SD=1.8). Compared to Washington, DC participants, Northern California participants were more likely to have heard of HBV (88.9 vs. 82.9%, $p < 0.01$), and to know that HBV can be transmitted by sharing needles (87.1 vs. 82.8%, $p=0.02$), by sharing toothbrushes (74.2 vs. 61.6%, $p < 0.01$), by sexual intercourse (62.4 vs. 56.5, $p=0.01$), and by childbirth (81.2 vs. 75.8%, $p=0.01$).

Table 3 shows the multivariable model for having heard of HBV. Statistically significant sociodemographic

variables associated with a higher likelihood of having heard of HBV included residence in Northern California [Odds Ratio (OR) 1.92, 95% Confidence Interval (95% CI) 1.37, 2.68], being a high school graduate (OR 1.89, 95% CI 1.31, 2.74), having some college education (OR 1.90, 95% CI 1.14, 3.17), being a college graduate (OR 4.62, 95% CI 2.70, 7.88), and having an annual household income greater than \$50,000 (OR 2.77, 95% CI 1.25, 6.14). Living in the U.S. for more than 10 years was associated with a lower likelihood of having heard of HBV (OR 0.62, 95% CI 0.40, 0.96). Among health status and healthcare access variables, having a family history of HBV infection (OR 1.79, 95% CI 1.05, 3.05) was associated with having heard of HBV. Among communication variables, having discussed HBV with family or friends (OR 2.20, 95% CI 1.54, 3.14) was associated with having heard of HBV.

Table 4 shows the multivariable model for the HBV transmission knowledge score among all participants. Sociodemographic variables associated with a higher score included residence in Northern California [coefficient (coeff.) 0.27, 95% CI 0.10, 0.44], being a high school graduate (coeff. 0.60, 95% CI 0.38, 0.82), speaking English well (coeff. 0.26, 95% CI 0.03, 0.49), and speaking English fluently (coeff. 0.63, 95% CI 0.32, 0.93). Living in the U.S. for more than 10 years was associated with a lower knowledge score (coeff. -0.24, 95% CI -0.47, -0.02). Among health status and healthcare access variables, having a family history of HBV (coeff. 0.33, 95% CI 0.12, 0.54) and having had a HBV blood test (coeff. 0.36, 95% CI 0.16, 0.56) were associated with a higher transmission knowledge score. Among communication variables, having discussed HBV with family or friends (coeff. 0.60, 95% CI 0.43, 0.77) was associated with a higher score.

Discussion

This population-based study with a large sample of Vietnamese Americans from two geographic areas shows that, although most had heard of HBV, knowledge regarding HBV transmission was moderate. In particular, knowledge of transmission at childbirth, a highly prevalent way in which Asian Americans acquire HBV, was only 78.6%, and by sexual intercourse was only 59.5%. Factors most strongly associated with having heard of HBV included higher educational attainment, higher income, and having discussed HBV with family or friends. Similarly, being born in the U.S. and having discussed HBV with family or friends were significantly associated with higher summary score regarding knowledge of HBV transmission.

Knowledge about modes of transmission of HBV varied, with most participants knowing about transmission by sharing needles but only slightly more than half knew about

Table 1 Characteristics for Vietnamese American participants in Northern California and Washington, D.C. Areas, 2011

	Total (n = 1666) %	Northern California (n = 857) %	Washington D.C. (n = 809) %	p value ^a
Sociodemographics				
Age category (years)				
18–29	8.0	8.2	7.9	0.59
30–49	43.1	41.9	44.4	
50–64	48.9	49.9	47.7	
Age (years, mean ± SD)	47.6 ± 11.6	47.9 ± 11.6	47.4 ± 11.6	0.35
Sex				
Female	58.4	60.9	55.8	0.03
Male	41.6	39.1	44.2	
Marital status				
Never married	16.2	15.6	16.9	0.76
Widowed, separated, divorced	5.6	5.6	5.6	
Married or has partner	78.1	78.8	77.5	
Education				
Less than high school	22.7	25.2	20.0	<0.01
High school graduate	29.8	32.2	27.3	
Some college	14.0	13.7	14.2	
College graduate or higher	33.6	28.9	38.5	
Years in U.S.				
≤10 years	20.3	22.7	17.8	0.01
>10 years	79.7	77.3	82.2	
Country of birth				
Born in U.S	2.4	2.3	2.5	0.85
Foreign-born	97.6	97.7	97.5	
English language fluency				
Less than well	68.0	74.9	60.7	<0.01
Well	20.2	15.6	25.2	
Fluent	11.8	9.6	14.2	
Employment status				
Employment	64.8	54.8	75.3	<0.01
Unemployed	35.2	45.2	24.7	
Annual household income				
<\$10,000	4.7	7.7	1.6	<0.01
\$10,000–30,000	21.3	29.4	12.7	
\$30,000–\$50,0000	13.9	13.1	14.7	
>\$50,000	34.5	25.9	43.6	
Unknown, don't know, refused	25.6	23.9	27.3	
Health status and healthcare access				
Had health insurance	81.2	81.7	80.8	0.63
Had family history of HBV	17.9	18.5	17.1	0.47
Had HBV blood test	73.3	76.5	69.8	<0.01
Had usual place to go when sick	73.5	75.6	71.3	0.05
Had regular doctor	70.1	71.3	68.9	0.30
Ethnicity of regular doctor				
Vietnamese	46.5	51.2	41.5	<0.01
Other Asian	8.8	11.9	5.5	
Not Asian	14.4	7.8	21.3	
Saw doctor in last 12 months	74.2	74.9	73.5	0.52
Communication with others				

Table 1 (continued)

	Total (n = 1666) %	Northern California (n = 857) %	Washington D.C. (n = 809) %	p value ^a
Doctor had recommended test for HBV	47.1	52.8	41.0	<0.01
Had discussed HBV with family/friends	46.8	51.5	41.9	<0.01

^ap value from Chi square tests for differences between the two geographic areas

Table 2 Hepatitis B-related knowledge among Vietnamese American participants, 2011

	Total (n = 1666) %	Northern California (n = 857) %	Washington D.C. (n = 809) %	p value ^a
Heard of hepatitis B	86.0	88.9	82.9	<0.01
Knew that hepatitis B can be transmitted:				
By sharing needles	85.0	87.1	82.8	0.02
By sharing toothbrushes	68.1	74.2	61.6	<0.01
By sexual intercourse	59.5	62.4	56.5	0.01
At childbirth	78.6	81.2	75.8	0.01
By infected people who look and feel healthy	69.8	70.4	69.1	0.58
Knew that hepatitis B cannot be transmitted:				
By smoking cigarettes	50.4	48.5	52.4	0.11
By being near a person who coughs or sneezes	52.1	51.6	52.7	0.66
By sharing food or eating utensils	35.6	35.6	35.6	1.0
Transmission knowledge score (range 0–8) (Mean ±SD)	5.0 ± 1.8	5.1 ± 1.7	4.9 ± 1.8	<0.01

^ap value from Chi square tests for differences between the two geographic areas

Table 3 Statistically significant variables in a multivariable model of having heard of hepatitis B among Vietnamese American participants in Northern California and Washington, D.C. Areas, 2011

Variable	Sociodemographic + health status and healthcare access + communication ^a OR (95% CI)
Northern California residence (ref. Washington D.C.)	1.92 (1.37, 2.68)
Education (ref. < high school graduate)	
High school graduate	1.89 (1.31, 2.74)
Some college	1.90 (1.14, 3.17)
College graduate or higher	4.62 (2.70, 7.88)
In U.S. > 10 years (ref. ≤ 10 years)	0.62 (0.40, 0.96)
Annual household income (ref. < \$10,000)	
> \$50,000	2.77 (1.25, 6.14)
Family history of hepatitis B (ref. no)	1.79 (1.05, 3.05)
Discussed with family/friends (ref. no)	2.20 (1.54, 3.14)

In the models the following covariates were included but not significant: age, gender, marital status, employment status, health insurance status, having a regular place to go when sick, having a regular doctor, ethnicity of regular doctor, having seen a doctor in the last 12 months, and participants' doctor had recommended a hepatitis B blood test

^aPseudo R² = 0.1701

transmission through sexual intercourse. Many participants incorrectly believed that smoking cigarettes, sneezing or coughing, or sharing food, drink, and utensils could

transmit HBV. These results are consistent with previous studies of knowledge about routes of HBV transmission [15, 23]. We found that 86.0% of participants in our study

Table 4 Statistically significant variables in a multivariate model of hepatitis B transmission knowledge score among Vietnamese American participants in Northern California and Washington, D.C. Areas, 2011

Variable	Sociodemographic + health Status and healthcare access + communication ^{a, b} Coeff. (95% CI)
Northern California residence (ref. Washington D.C.)	0.27 (0.10, 0.44)
English fluency (ref. not well)	
Well	0.26 (0.03, 0.49)
Fluent	0.63 (0.32, 0.93)
Education (ref. <high school graduate)	
High school graduate	0.60 (0.38, 0.82)
Some college	0.78 (0.50, 1.06)
College graduate or higher	0.80 (0.54, 1.05)
Born in the U.S. (ref. foreign-born)	0.77 (0.16, 1.37)
In U.S. > 10 years (ref. ≤ 10 years)	-0.24 (-0.47, -0.02)
Family history of hepatitis B (ref. no)	0.33 (0.12, 0.54)
Had hepatitis B blood test (ref. no)	0.36 (0.16, 0.56)
Discussed with family/friends (ref. no)	0.60 (0.43, 0.77)

In the models the following covariates were included but not significant: age, gender, marital status, employment status, annual household income, health insurance status, having a regular place to go when sick, having a regular doctor, ethnicity of regular doctor, having seen a doctor in the last 12 months, and participants' doctor had recommended a hepatitis B blood test

^aAdjusted $R^2=0.1779$

^bInterpreting this coefficient: a resident of Northern California would have a 0.27 higher hepatitis B transmission knowledge score than a resident of DC, holding all other variables constant. The coefficients of other variables in this multivariable regression can be interpreted in a similar way

had heard of HBV, similar to a 2002 survey of Vietnamese Americans in Seattle, which found a rate of 80.8% [15]. The Seattle study found that 69.1% knew of sexual intercourse and 72.2% knew of sharing toothbrushes as modes of transmission [15] compared to 59.5% and 68.1%, respectively, in our study. We found that only 52.1% knew that HBV could not be transmitted by someone who coughs or sneezes, compared to the 31.5% who knew that in the Seattle study [15]. A more recent study in 2013 among Vietnamese Americans in California found that only 53–65% were aware of exposure risks such as sexual contact, blood transfusions, and/or contaminated needles, compared to our finding that 59.5% knew about sexual contact and 85.0% knew about sharing needles as modes of HBV transmission. The higher rates of knowledge in our study may be due to the fact that our study followed a media intervention in Northern California. There may also have been ongoing community efforts to increase awareness of HBV [24–26].

Even though the percentage of participants in this study knowing that HBV could be transmitted by sexual intercourse with an infected person, by sharing toothbrushes, and by an infected person who looks and feels healthy were higher than previous studies [15, 23], they are still suboptimal. Given the burden of HBV infections and HBV-related liver disease in this population, knowledge about HBV transmission needs improvement. Incorrect knowledge about the modes of HBV transmission

can lead to misguided preventive behaviors and continued stigma against those with HBV [23]. Concern about social stigma has been a documented barrier to HBV screening, diagnosis, and treatment: respondents face fear and shame regarding transmission of HBV to their loved ones and discrimination in the workplace or school [18, 25, 27, 28]. For example, the high rate of participants incorrectly believing that HBV could be spread by sharing food, drink, or utensils demonstrates the high level of distress regarding the contagiousness of HBV, which can hinder open discussions regarding HBV. In order to reduce the incidence of HBV and HBV-related liver disease, prevention of HBV infections is essential, and efforts to improve education about modes of HBV transmission, particularly during sexual intercourse and childbirth, remain key.

Notably, being a Northern California resident was significantly associated with both measures of HBV knowledge compared to Washington D.C. area residents. Differences in knowledge among the various age groups do not account for the differences in knowledge of HBV transmission between Northern California and Washington D.C. The bivariate models demonstrated a lower knowledge score in the older age groups compared to the younger age group; however, this difference was not statistically significant in the multivariate model. One explanation for the association between being a Northern California resident and HBV knowledge may be heterogeneity among the

Vietnamese population in the U.S. thereby leading to differences in exposures among Vietnamese Americans living in the Northern California and Washington D.C. areas. The Washington, D.C. sample indeed had less education but were more likely to have lived in the U.S. longer, be more fluent in English, be employed, and have higher incomes. These differences suggest that unmeasured variables influenced HBV knowledge. One possible explanation is that this survey was conducted after a mass media intervention in Northern California, which may have led to increased knowledge about HBV [16].

Multivariable analyses demonstrated that having lived in the U.S. longer than 10 years was negatively associated with having heard of HBV and was associated with a lower knowledge of HBV transmission score. This seems surprising as other studies have demonstrated that longer residence in the U.S. is associated with increased health knowledge and receipt of health services among Vietnamese Americans for breast and cervical cancer [29–31]. However, the lower knowledge score of routes of HBV transmission for those who have lived in the U.S. longer in our study may be due to the fact that there has recently been increased awareness of the need to improve rates of screening and vaccination for HBV among more recent immigrants in this vulnerable population [32].

English-language fluency was not significantly associated with having heard of HBV, though it was significantly associated with the knowledge of HBV transmission score. If more materials about routes of HBV transmission were available in English, or if more English-speaking physicians were talking to their patients about HBV, it would not be surprising that patients who have better English fluency would have increased knowledge about HBV. On the other hand, the barriers that Vietnamese-speaking Americans face in gaining access to such information in their own language have been well-documented [16, 33]. Future interventions need to ensure that information about HBV transmission, screening, and vaccination are provided to Vietnamese Americans in a culturally and linguistically appropriate manner to reduce the gap in knowledge.

One of the factors most strongly associated with having heard of HBV and with the knowledge of HBV transmission score is having discussed HBV with family or friends. This finding highlights the importance of reducing its stigma so that people are willing to talk about HBV and related illnesses. Future interventions could therefore incorporate a component of encouraging community conversations about HBV. However, such interventions also need to ensure that the information being passed along is medically accurate. Interestingly, healthcare access and physician recommendation for screening were not associated with hepatitis B knowledge. Although we did not ask where the participants get their HBV-related knowledge from, this suggests

that Vietnamese Americans are not obtaining information about hepatitis B from the healthcare system or their physicians. This raises the need to better inform physicians about the importance of educating their Vietnamese American patients about HBV, a recommendation emphasized in the IOM report on control of viral hepatitis [32].

Limitations of this study include the fact that the survey was conducted in 2011 and therefore may not represent the current status of HBV knowledge among Vietnamese Americans. Since this was a survey conducted over the telephone, generalizability is limited to those who owned and answered a landline telephone. Furthermore, because this was a cross-sectional study, we cannot make causal inferences. Finally, the study participants included Vietnamese Americans living in Northern California and Washington, DC/Maryland/Virginia. While these two communities represent a large percentage of the Vietnamese American population, they may not be representative of the Vietnamese American population as a whole. However, focusing on two communities makes this study more generalizable than single-site studies.

A 2010 report by the Institute of Medicine acknowledged that HBV remains a serious health problem in the U.S., particularly among at-risk populations, and specifically addressed the lack of knowledge and awareness about chronic viral hepatitis by members of at-risk populations, healthcare providers, and policy makers [32]. Our study demonstrates that knowledge about some modes of HBV transmission among Vietnamese Americans remains limited. The findings of this study can help to inform the design and implementation of linguistically and culturally appropriate interventions to reduce the burden of HBV and HBV-related liver disease in this vulnerable population.

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