

Published in final edited form as:

*Asian Pac J Cancer Prev*. 2011 ; 12(4): 957–961.

## Hepatitis B Knowledge and Practices among Cambodian Americans

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### Abstract

**Background**—Liver cancer occurs more frequently among Americans of Southeast Asian descent than any other group. This health disparity can be attributed to high rates of hepatitis B virus (HBV) infection. We examined HBV awareness, knowledge about HBV transmission, HBV testing levels, and HBV vaccination levels among Cambodian Americans.

**Methods**—A population-based survey was conducted in metropolitan Seattle during 2010. The study sample included 667 individuals. We created a composite knowledge score (0–9) by summing the number of correct answers to survey items addressing HBV transmission. Data were analyzed using Generalized Estimating Equations.

**Results**—Seventy-eight percent of the study group had heard of HBV (before it was described to them). The proportions who knew that HBV cannot be spread by eating food prepared by an infected person, can be spread during childbirth, and can be spread during sexual intercourse were only 33%, 69%, and 72%, respectively. The mean knowledge score was 5.5 (standard deviation 1.7). Fifty percent of the survey respondents had been tested and 52% had been vaccinated. HBV awareness, higher knowledge scores, and vaccination were all associated ( $p < 0.05$ ) with younger age, higher educational level, younger age at immigration, and greater English proficiency.

**Discussion**—Our study findings confirm the need for Khmer language HBV programs for less acculturated and educated members of the Cambodian community. Such programs should aim to increase HBV testing rates, HBV vaccination rates among individuals who remain susceptible to infection, and levels of knowledge about routes of hepatitis B transmission.

### Keywords

Cambodian Americans; hepatitis B; immigrant health; liver cancer

### Introduction

Liver cancer occurs more frequently among Southeast Asians (Cambodian, Hmong, Lao, and Vietnamese) in the United States (US) than individuals of any other race/ethnicity (Kem and Chu, 2007; Miller et al., 2008; Wong and Corley, 2008). This health disparity can be

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attributed to high rates of hepatitis B virus (HBV) infection combined with low levels of HBV vaccination coverage (Parkin, 2006). Refugee program data indicate that over 10% of Cambodian immigrants are chronically infected with HBV, compared to less than 0.5% of the general US population (Centers for Disease Control, 1991). Further, cancer registry data show that the liver cancer incidence rate among Cambodian men is 51 per 100,000, compared to 7 per 100,000 among non-Latino white men. The rates for Cambodian and non-Latina white women are 14 per 100,000 and 3 per 100,000, respectively (Kem and Chu, 2007).

In Southeast Asia where HBV is highly endemic, transmission often occurs vertically at birth (London and McGlynn, 2006). However, US studies show that the prevalence of previous HBV infection increases steadily with age in Southeast Asian immigrant populations. Therefore, it is clear that horizontal transmission, through close household contact (e.g., sharing razors and toothbrushes), also contributes to high HBV infection rates among Southeast Asians (Franks et al., 1989; Gjerdingen and Lor, 1997). Cambodian American adults are also at risk of HBV infection from sexual activity with other members of their community (Centers for Disease Control and Prevention, 2006).

Exposure to HBV often results in immunity following an asymptomatic infection or acute hepatitis. However, a significant proportion of those exposed to HBV become chronically infected (Kim et al., 2004; Lok and McMahon, 2007). The Centers for Disease Control and Prevention specify that all immigrants from endemic areas of the world such as Cambodia, as well as their US-born children should be tested for HBV (regardless of whether they have been vaccinated against HBV or not) (Centers for Disease Control and Prevention, 2008). Serologic testing allows the identification of chronically infected individuals who may benefit from anti-viral therapy and should take precautions to avoid infecting others, as well as susceptible individuals who should be vaccinated against the infection (Centers for Disease Control and Prevention, 2006; Chao et al., 2009; Lin et al., 2007).

The 2010 Institute of Medicine Report on Hepatitis and Liver Cancer called for HBV research focusing on at-risk populations, and emphasized the importance of assessing HBV knowledge and practices among foreign-born populations from endemic geographic areas (Institute of Medicine, 2010). In collaboration with a Cambodian Community Coalition, we conducted a needs assessment survey of Cambodian American men and women in Seattle, Washington during 2010. This descriptive report focuses on Cambodians' HBV awareness, knowledge, testing levels, and vaccination levels.

## Materials and Methods

### Overview

We conducted a population-based needs survey of Cambodian households in the metropolitan Seattle area of Washington State. Our survey was conducted over a six-month period (February–July, 2010). Survey items addressed hepatitis B awareness and knowledge about hepatitis B transmission routes, as well as hepatitis B testing and vaccination. The survey instrument was developed in English, translated into Khmer, back translated to ensure lexical equivalence, reconciled, and pre-tested (Eremenco et al., 2005). The Fred Hutchinson Cancer Research Center Institutional Review Board approved our survey instrument and study procedures.

### Sampling

We applied a list of Cambodian last names to an electronic database of telephone listings for the metropolitan Seattle area. Specifically, we identified 1,147 addresses that were located in metropolitan Seattle (King County and the southern part of Snohomish County) and were

associated with one of the Cambodian last names. All these addresses were included in our survey sample.

### Survey Recruitment

Addresses in our survey sample received an introductory letter (Khmer and English versions) from the project. Surveys were conducted in participants' homes by bilingual, bicultural Cambodian interviewers. Male survey workers interviewed men and female survey workers interviewed women. Respondents were given the option of completing their survey in Khmer or English, and received a \$20 grocery store card as a token of appreciation for their time. Five door-to-door attempts were made to contact each household (including at least one daytime, one evening, and one weekend attempt).

### Participant Selection

Cambodians in the 18–64 age group were included in our survey. Because the survey was used to recruit men and women for a subsequent liver cancer control household intervention program, we aimed to interview a man and a woman in each household (rather than one individual in each household). If a household included more than one age-eligible Cambodian man, we attempted to interview the man with the most recent birthday. The same approach was used if a household included two or more age-eligible Cambodian women.

### Survey Instrument

Respondents were asked whether they had ever heard of hepatitis B. After responding to this question, they were read the following statement: "Hepatitis B is an inflammation of the liver caused by a viral infection. It sometimes makes the skin and eyes go yellow. However, many infected people do not have any symptoms." Respondents were then asked if they had ever had a blood test specifically for hepatitis B. When this question was asked, respondents were reminded that routine blood testing (e.g., during annual physical exams) does not include a hepatitis B test. Additionally, respondents were asked if they had ever had shots (vaccinations) to prevent them from getting hepatitis B.

The survey instrument included a section addressing knowledge about HBV transmission routes. Survey participants were asked whether they thought hepatitis B can be spread during childbirth, during sexual intercourse, by sharing toothbrushes, by sharing razors, and by sharing needles. We also queried participants about routes of transmission that are not applicable to HBV. Specifically, we asked whether they thought hepatitis B can be spread by eating food prepared by an infected person, by sharing chopsticks during a meal, by coughing, and by holding hands.

Survey participants provided information about their age, educational level, birthplace, and English-language proficiency. Foreign-born participants specified how many years they had lived in the US.

### Data Analysis

Age was categorized as <40 years versus ≥40 years, educational level was categorized as <12 years versus ≥12 years, and age at immigration was categorized as <20 years versus ≥20 years. US-born individuals were included in the <20 years group for the age at immigration variable. Respondents were categorized as being proficient in English if they indicated they spoke English fluently or well (rather than so so, poorly or not at all).

The response options for the knowledge items were yes, no, and not sure/don't know. Responses were dichotomized into yes versus other if the correct answer was yes (e.g.,

hepatitis B can be spread during sexual intercourse), and no versus other if the correct answer was no (e.g., hepatitis B can be spread by coughing). We created a composite knowledge score (0–9) by summing the number of correct answers to the items addressing HBV transmission. We also created a four-category testing and vaccination variable (tested and vaccinated, tested but not vaccinated, vaccinated but not tested, and neither tested nor vaccinated).

Our analyses examined demographic characteristics that were associated with HBV awareness, the HBV knowledge score, HBV testing, and HBV vaccination. Lin and colleagues have recently emphasized the importance of testing Asian immigrants for HBV even if they have been vaccinated against the disease (because they could have become chronically infected prior to vaccination) (Lin et al., 2007). Therefore, we specifically examined the demographic characteristics of individuals who had been vaccinated but not tested.

Our study sample included men and women from the same household and individual responses from the same household may have been correlated (i.e., the independence of observations could not be assumed). To account for the potential correlation of observations, the modification of unconditional logistic regression by Generalized Estimating Equations (GEE) was used in the analysis of binary responses (HBV awareness, testing, and vaccination). Similarly, the modification of linear regression by GEE was used in the analysis of knowledge score (Liang and Zeger, 1986). When HBV testing and vaccination were examined jointly there were more than two response categories and, therefore, the bootstrapping technique was used to account for potential within-household correlations (Efron and Tibshirani, 1994). Multivariable analyses were conducted using GEE-modified unconditional multivariable logistic regression and GEE-modified multiple linear regression (Liang and Zeger, 1986).

## Results

### Survey Response

We were able to verify that 580 of the 1,147 addresses in our survey sample were Cambodian households (included at least one Cambodian man and/or woman). The remaining addresses had the following dispositions: household verified not to be Cambodian (250 addresses), unable to contact household (182 addresses), and not a residential address (135 addresses). Survey dispositions in the 580 households that were verified to be eligible for survey participation are given in Table 1.

A total of 667 Cambodians from 414 households completed a survey. In 253 of these households, both a Cambodian man and woman participated in the survey, in 47 of these households a man (but not a woman) participated, and in 114 of these households a woman (but not a man) participated. Surveys were completed by 300 (67%) of the 449 Cambodian men that interviewers were able to contact, and 367 (73%) of the 501 Cambodian women that interviewers were able to contact.

### Characteristics of Survey Sample

Table 2 provides information about the characteristics of our survey sample. Thirty-four percent were less than 40 years of age and 58% had less than a high school education. Only 6% of the respondents were born in the US, 62% were immigrants who came to the US when they were 20 years or older, and 24% were proficient in English. The male respondents were significantly older, more likely to have at least a high school education, and more likely to speak English proficiently than female respondents; and women were

significantly more likely to be immigrants who came to the US when they were 20 years or older than men.

### Hepatitis B Awareness and Knowledge

Seventy-eight percent of the study group had heard of HBV (before the disease was described to them). As shown in Table 3, the following variables were strongly associated ( $p < 0.001$ ) with HBV awareness in bivariable comparisons: younger age, higher educational level, US birth, younger age at immigration, and English proficiency. Table 4 gives the proportions of men and women who gave correct responses to the individual HBV knowledge items. A minority of survey respondents knew that HBV cannot be spread by eating food that has been prepared by an infected person (33%), cannot be spread by sharing chopsticks (21%), and cannot be spread by coughing (29%). Only 69% of the respondents knew that HBV can be spread during childbirth and only 72% knew that HBV can be spread during sexual intercourse. Men were more likely ( $p = 0.04$ ) to know sharing chopsticks cannot spread HBV than women.

The mean knowledge score was 5.5 (standard deviation 1.7) for the study group as a whole, 5.7 (standard deviation 1.7) for male participants, and 5.4 (standard deviation 1.7) for female participants ( $p = 0.03$ ). Higher mean knowledge scores were strongly associated ( $p < 0.001$ ) with all the other demographic variables (younger age, higher educational level, US birth, younger age at immigration, and English proficiency).

### Hepatitis B Testing and Vaccination

Fifty percent of the study group had been tested for HBV and 52% had been vaccinated against HBV. Table 3 gives variables that were associated with testing and vaccination in bivariable analyses. The only demographic variable that was associated with testing was female gender ( $p = 0.01$ ). Vaccination was associated ( $p < 0.05$ ) with younger age, higher educational level, younger age at immigration, and English proficiency; and marginally associated ( $p = 0.07$ ) with female gender.

The proportions of all study participants reporting testing and vaccination, testing but not vaccination, vaccination but not testing, and neither testing nor vaccination were 36%, 14%, 16%, and 34%, respectively. The proportions of men in these categories were 31%, 14%, 18%, and 37%; and the proportions of women in these categories were 40%, 14%, 15%, and 31% ( $p = 0.053$ ). As shown in Table 3, vaccination without prior testing was associated ( $p < 0.05$ ) with younger age and US birth. Additionally, English language proficiency was marginally associated ( $p = 0.06$ ) with vaccination without prior testing.

### Multivariable Regression Results

HBV awareness was independently associated with higher educational level ( $p < 0.001$ ), US birth ( $p = 0.004$ ), and English proficiency ( $p < 0.001$ ) in our multivariable GEE analysis. Two variables were independently associated with higher mean knowledge scores: younger age ( $p = 0.04$ ) and English proficiency ( $p < 0.001$ ). Testing was independently associated with female gender ( $p = 0.007$ ) but no other demographic variables. Female gender ( $p = 0.02$ ) and higher educational level ( $p = 0.008$ ) were independently associated with vaccination. No demographic variables were associated with vaccination without prior testing in our multivariable analysis.

### Discussion

We identified some important knowledge deficits with respect to hepatitis B among Cambodian Americans. Only 33% of the respondents knew that HBV cannot be spread by

eating food prepared by an infected person and only 29% knew that HBV cannot be spread by coughing. These findings suggest that Cambodians may be confusing hepatitis B with other infectious diseases such as hepatitis A and tuberculosis. About one-third of the respondents did not know that HBV can be spread during childbirth (31%) and sexual intercourse (28%). Therefore, it is likely that chronically infected Cambodians are infecting others because they lack knowledge about HBV transmission routes.

Our study indicates that only one-half of Cambodian Americans have been tested for HBV. Recent studies conducted in Western Washington State; Northern California and Metropolitan Washington DC; and Northern California, Southern California, and Western Washington State have consistently shown that about two-thirds of Vietnamese Americans have been tested for HBV (Grytdal et al., 2009; Nguyen et al., 2010, Taylor et al., 2004; Taylor et al., 2005). Female respondents were significantly more likely to report HBV testing than male respondents. The Centers for Disease Control and Prevention have recommended universal HBV testing during pregnancy for over two decades and, therefore, many younger Cambodian women may have received HBV testing as part of their prenatal care (US Preventive Services Task Force, 2009).

We have previously reported that 11% of Chinese immigrants to Seattle have been vaccinated against HBV without prior testing (to establish whether they are chronically infected with the disease) (Taylor et al., 2006). Similarly, 16% of our Cambodian study sample reported that they had been vaccinated against HBV, but not tested. In Asian countries, the majority of HBV carriers are infected as infants or young children (London, 2006). Therefore, a proportion of Cambodian Americans who have been vaccinated without testing are probably carriers who should be taking precautions to avoid infecting others and, in some cases, would benefit from medication to control their chronic HBV disease.

Cambodians in the US are educationally disadvantaged (53% have less than a high school education) and linguistically isolated (92% speak Khmer at home) (US Department of Commerce, 2004). HBV awareness, higher knowledge scores, and vaccination were all associated with higher educational level and greater English proficiency in bivariable comparisons. Therefore, our study findings confirm the need for Khmer language HBV educational materials and campaigns specifically for less acculturated and educated members of the Cambodian community.

Our study has several strengths. Specifically, we used population-based sampling methods, administered our survey in the language of each participant's choice, and had a relatively good cooperation rate. However, our study also has several limitations. Specifically, respondents were recruited in one geographic area of the US, households were only eligible if they were included in an electronic database of telephone listings, survey respondents may have had different preventive behavior patterns than those who were unreachable or refused to participate, and our study relied on self-reported data (which may be faulty due to inaccurate recall or desirability bias).

Avoidable mortality from hepatitis B-related liver disease is one of the most important health disparities experienced by Asian Americans, and Cambodian immigrants are over 25 times more likely to have evidence of chronic HBV infection than the general US population (President's Advisory Commission on Asian Americans and Pacific Islanders, 2003). Future research should develop and evaluate culturally and linguistically appropriate liver cancer control Intervention programs for Cambodian Americans. Such programs should aim to increase HBV serologic testing rates, HBV vaccination rates among individuals who remain susceptible to infection, and levels of knowledge about routes of HBV transmission in Cambodian American communities.



## Acknowledgments

This research was supported by grant CA134245 from the National Cancer Institute. We thank the Cambodian community leaders who participate in our advisory group for their assistance and advice, as well as the survey interviewers for their outstanding work.

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**Table 1**

Dispositions in Households with One or More Cambodians (N=580)

<b>Disposition</b>	<b>No.</b>
Cambodian Men	
Interview completed by age-eligible man	300
No age-eligible man	105
Age-eligible man not home after 5 attempts	26
Age-eligible man refused	149
Cambodian Women	
Interview completed by age-eligible woman	367
No age-eligible woman	61
Age-eligible woman not home after 5 attempts	18
Age-eligible woman refused	134

**Table 2**

## Study Group Characteristics

Variable	Men	Women	p-value	Total
≥40 years old	214 (72)	225 (62)	0.005	439 (66)
≥12 years education	158 (53)	121 (33)	<0.001	279 (42)
Born in US	20 (7)	20 (5)	0.48	40 (6)
≥20 years old at immigration	174 (58)	238 (65)	0.02	412 (62)
English proficient	85 (28)	77 (21)	0.01	162 (24)

Table 3

Hepatitis B Awareness, Knowledge, Testing, and Vaccination by Demographics (N=667)

Variable	Heard of HBV%	p-value	Mean knowledge score (SD)		Tested for HBV	p-value	Vaccinated for HBV	p-value	Vaccinated but not tested	p-value
			score	(SD)						
Gender	Male	79	0.44	5.7 (1.7)	0.03	45	49	0.01	18	0.33
	Female	77		5.4 (1.7)		54	55		15	
Age	<40 years	88	<0.001	6.1 (1.7)	<0.001	51	60	0.63	21	0.03
	≥40 years	72		5.3 (1.6)		49	48		14	
Education	<12 years	68	<0.001	5.2 (1.5)	<0.001	46	47	0.11	15	0.10
	≥12 years	91		6.0 (1.8)		54	60		19	
US-born	Yes	100	<0.001	6.9 (1.4)	<0.001	43	63	0.34	30	0.02
	No	76		5.5 (1.6)		50	52		16	
Immigration age	<20 years	88	<0.001	6.1 (1.7)	<0.001	52	58	0.36	19	0.18
	≥20 years	71		5.2 (1.6)		48	49		15	
English proficiency	Yes	98	<0.001	6.5 (1.5)	<0.001	55	61	0.22	21	0.06
	No	71		5.2 (1.6)		48	49		15	

**Table 4**

## Knowledge about Hepatitis B Transmission

Variable	Men (300)	Women (367)	p-value	Total (667)
Hepatitis B cannot be spread by eating food prepared by an infected person	104 (35)	114 (31)	0.29	218 (33)
Hepatitis B cannot be spread by sharing chopsticks	72 (24)	66 (18)	0.04	138 (21)
Hepatitis B cannot be spread by coughing	94 (31)	102 (28)	0.28	196 (29)
Hepatitis B cannot be spread by holding hands	224 (75)	283 (77)	0.40	507 (76)
Hepatitis B can be spread during childbirth	211 (70)	250 (68)	0.50	461 (69)
Hepatitis B can be spread during sexual intercourse	225 (75)	254 (69)	0.08	479 (72)
Hepatitis B can be spread by sharing toothbrushes	255 (85)	300 (82)	0.26	555 (83)
Hepatitis B can be spread by sharing razors	247 (82)	286 (78)	0.14	533 (80)
Hepatitis B can be spread by sharing needles	279 (93)	335 (91)	0.41	614 (92)