

Predictors and Barriers to Hepatitis B Screening in a Midwest Suburban Asian Population

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Abstract Despite guidelines recommending hepatitis B virus (HBV) screening among the Asian population, not all Asians are screened. We assessed barriers to and factors predicting HBV screening in Michigan. Adults residing in Southeast Michigan self-identifying as Asian were surveyed at Asian grocery stores, restaurants, churches, and community events. 404 persons participated in the survey, 54% were women, median age was 51 years, 63% were Chinese, and 93.8% were born outside the U.S. 181 (44.8%) had not or could not recall having been screened for HBV. Of these, 89% said their primary care physicians (PCP) had never brought up screening. Unscreened participants were more likely to think HBV is genetically inherited and cannot be treated than those who had been screened. They were also more likely to think they should avoid close contact with others, would bring shame to their families, and lose their job, if found to be infected with HBV. Among 223 (55.2%) who had been screened, 48% said their PCP had the greatest influence in their decision to be screened and 70.9% said they were screened at a doctor's visit. Screened participants were more likely to know someone with HBV, have a PCP, and have health insurance. Logistic regression analysis showed knowing someone with HBV was the only predictor for screening. Despite guidelines for HBV screening, only half of the

Asian Americans surveyed had been screened. Increasing awareness among PCPs is needed to increase HBV screening in this population.

Keywords Knowledge · Stigma · Vaccination · United States

Introduction

Chronic hepatitis B virus (HBV) infection is the leading cause of primary liver cancer in the world, and primary liver cancer is the third leading cause of cancer-related death in the world [1–5]. Both HBV and primary liver cancer are more common among Asians than other racial/ethnic groups [6–8]. Despite this, Asians were not considered a distinct racial group in the National Health and Nutrition Examination Survey (NHANES) in the United States (U.S.), and until recently there was no national data on the prevalence of HBV infection among Asians living in the U.S. [6, 9]. The first available NHANES data collected in 2011–2012 estimated a 10-fold higher prevalence of chronic HBV infection compared to the general U.S. population—3.1% in non-Hispanic Asians compared to 0.3% in the general population [6]. Based on the census in 2015, Asians comprise 5.6% of the U.S. population but they account for almost 60% of those living with chronic HBV infection in the U.S. [2, 10].

Hepatitis B and HBV-related liver cancer are the most important health disparity among Asian Americans. Screening is the first step toward decreasing the burden of chronic HBV infection among Asian Americans because it identifies infected individuals who can be referred for monitoring and treatment, as well as individuals who would benefit from vaccination.

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Previous studies have found screening is an effective way to diagnose the disease early such that affected persons can be referred and receive the care they need [8, 11, 12]. The Centers for Disease Control and Prevention (CDC) in the U.S. recommends routine screening for those born in regions of high or intermediate HBV endemicity as well as un-vaccinated U.S. born individuals with parents from regions of high or intermediate HBV endemicity [13]. Almost all Asian countries have high or intermediate prevalence of HBV infection. However, previous studies have estimated HBV screening rates among Asian Americans to be low, ranging from 28 to 66% [14–22]. One study broadly summarizes the three types of barriers Asian Americans face that result in lack of screening, care or treatment—provider, patient, and resource-related barriers [12]. Provider-related barriers include physicians' lack of recommendations for screening as well as provider-knowledge about HBV. Patient-related barriers include lack of knowledge about HBV, low proficiency of English language, unfamiliarity with the U.S. health system, education level, culture and beliefs, as well as feelings of shame and embarrassment if found to be infected. Resource-related barriers include access to healthcare such as having health insurance or having a primary care physician (PCP), and access to education materials such as videos, informational brochures, and other print or online materials [12].

Majority of studies of HBV screening among Asians in the U.S. have been conducted in California where there is more awareness of HBV and more government resources on education and screening [17, 23, 24]. However, a substantial number of Asians live in other regions of the U.S. According to the 2010 census, 12% of Asians in the U.S. reside in the Midwest, compared to 46% in the West [25]. Prior studies found the prevalence of chronic HBV infection among Asians living in the Midwest to be between 6 and 12%, yet there have been very little public health efforts to raise awareness in this region [11, 26]. We conducted a survey study to determine HBV screening rate and to identify barriers to HBV screening among Asian Americans. Our goal is to develop strategies to improve HBV screening and to eliminate this overlooked health disparity in the Asian American community. Our study was conducted in the Midwest where there is low awareness about HBV; therefore, we also assessed HBV knowledge and attitude about HBV infection to determine if these factors contribute to low HBV screening rate.

Methods

We conducted a survey study among adult Asian Americans living in suburban, Southeast Michigan between June 18 and August 14, 2016. The University of Michigan Institution Review Board approved this study.

Survey Design

Two surveys were created for this study. One survey was for participants who have not been screened for HBV (Group A); the other survey was for participants who have been screened for HBV (Group B). Participants who were not sure if they had ever been screened were given the survey for those who have not been screened (Group A).

The surveys were initially developed in English by the researchers and then translated into Chinese, Korean, and Vietnamese by members in the community with native fluency in the language. These translations were then back translated by different members in the community with fluency in the language to verify accuracy in translation. We conducted pilot testing on 12 (four of each) Chinese, Korean, and Vietnamese individuals with native fluency in their respective languages. Revisions were made based on feedback received.

Both surveys contained sections on demographics, HBV vaccine status, knowledge, and attitude if they were found to be infected. Only Survey A has a section with hypothetical questions regarding HBV screening, treatment and vaccine preferences, while Survey B has a section regarding HBV treatment among those who are chronically infected.

Survey questions were adapted from previous studies on HBV, as well as surveys on HCV and colon cancer screening [18, 19, 27, 28]. The knowledge section consists of 16 true or false questions, which were divided into three categories—knowledge of transmission (9 questions), knowledge of prevention (4 questions), and knowledge of disease progression (3 questions). Those who correctly responded to a statement would receive a score of +1, and those who incorrectly responded or did not respond would receive a score of 0. A maximum score of 16 equates to a perfect knowledge score.

The attitudes section consisted of five yes or no questions to assess potential stigma if the respondent had HBV. Those who responded “yes” or did not respond to a statement would receive a score of +1 for the statement, and those who responded “no” would receive a score of 0 for the statement. A maximum score of 5 represents the highest level of stigma.

Group A participants were asked to self-select which factor had the greatest influence in not being screened, and Group B participants were asked to self-select which factor had the greatest influence in their decision to be screened. These group-specific questions were used to assess what factors participants believe to be most influential in their screening decisions.

To assess physician, patient, and resource related barriers to HBV screening in unscreened participants, we divided the questions and data into three domains. The following questions were used to assess provider-related barriers:

has your PCP ever brought up screening, and would you be screened if your PCP brought up screening. To assess patient-related barriers to HBV screening, we included demographics, education, and responses to questions: do you know someone with HBV, would you be more likely to get screened if you knew someone with HBV, HBV knowledge and attitude if infected. To assess resource-related barriers, the questions: do you have health insurance, do you have a PCP, and would you undergo HBV screening if it were free, were used.

Site Selection and Participant Recruitment

During planning of this study, we contacted nine Asian grocery stores, five restaurants, nine churches, one community center, and one Tai Chi group in Southeast Michigan for permission to conduct this study on their premise. These sites were selected based off of the high Asian population that frequents these locations. We contacted store and restaurant managers, church and community leaders in order to obtain permission to conduct the study at these sites. We were able to conduct the study in seven grocery stores, three restaurants, nine churches, two language exchange classes and two community events over an 8-week study period. Table 1 lists the sites and settings in which this study was conducted and the number of participants enrolled at each site. Self-identified Asians over the age of 18 were approached at the study sites. The purpose of the study was described, and those who consented to participate self-administered one of two anonymous surveys: one for those who have not been screened or were uncertain if they had ever been screened for HBV (Group A), and one for those who had been screened for HBV (Group B).

Data Analyses

Data were entered into a REDCap database and analyses were conducted using IBM SPSS Statistics (SPSS, version 23). Logistic regression analysis was performed to identify predictors for HBV screening. Participant characteristics (Table 2) with p values <0.1 on univariate analyses, education level, knowledge and stigma scores were included in the logistic regression model. Multiple linear regression analyses were performed to identify predictors for HBV knowledge and for HBV stigma. Participant characteristics with p values <0.1 on univariate analyses were included in the linear regressions. Knowledge score was also included in the model for stigma score, and stigma score was included in the model for knowledge score. P values <0.05 were considered statistically significant.

Table 1 Sites and settings where survey study was conducted

Setting	Location	No. of surveys completed
Community event	Community festival	19
	Culture camp	64
	Tai chi group	19
	Total	102
Language exchange	Chinese language exchange	6
	Korean language exchange	8
	Total	14
Church group	Chinese church 1	26
	Chinese church 2	29
	Chinese church 3	14
	Chinese church 4	15
	Chinese church 5	28
	Korean church 1	36
	Korean church 2	17
	Korean church 3	35
	Korean church 4	21
	Total	221
Grocery store	Chinese grocery 1	7
	Chinese grocery 2	8
	Chinese grocery 3	5
	Chinese grocery 4	5
	Chinese grocery 5	9
	Korean grocery 1	7
	Korean grocery 2	6
	Total	47
	Restaurant	Chinese restaurant 1
Chinese restaurant 2		7
Chinese restaurant 3		6
Total		20
Total		404

Results

Characteristics of the Participants Studied

A total of 404 adults residing in Southeast Michigan were enrolled in the study: 181 (44.8%) Group A and 223 (55.2%) Group B. Characteristics of these two groups are shown in Table 2. Approximately half of our study population was female (53.7%), most were married (72.5%), identified themselves as Chinese (62.9%), and were born outside the U.S. (93.8%). Majority of participants reported having a 2-year or 4-year college education (43.6%), or a graduate level education (33.9%). Most (83.7%) had some form of health insurance, 77.7% had a PCP, and 50.2% had seen a physician within the last year.

Table 2 Characteristics of participants

	Combined n=404	Group A n=181	Group B n=223	p values
Sex [n (%)]				
Male	180 (44.6%)	89 (49.2%)	91 (40.8%)	0.366
Female	217 (53.7%)	91 (50.3%)	126 (56.5%)	
Missing	7 (1.7%)	1 (0.5%)	6 (2.7%)	
Age				
Mean ± SD	50.25 ± 11.31	49.93 ± 10.84	50.51 ± 11.71	0.614
Median	51	52	51	
Range	18–79	18–77	18–79	
Missing	11 (2.7%)	1 (0.5%)	10 (4.5%)	
Marital status [n (%)]				
Single	46 (11.4%)	25 (13.8%)	21 (9.4%)	0.366
Married	293 (72.5%)	128 (70.8%)	165 (74%)	
Divorced	33 (8.2%)	18 (9.9%)	15(6.7%)	
Widowed	20 (5%)	8(4.4%)	12 (5.4%)	
Missing	12 (2.9%)	2 (1.1%)	10 (4.5%)	
Education [n (%)]				
Middle/high school	84 (20.8%)	43 (23.8%)	41 (18.4%)	0.135
2-year/4-year college	176 (43.6%)	84 (46.4%)	92 (41.2%)	
Graduate	137 (33.9%)	53 (29.3%)	84 (37.7%)	
Missing	7 (1.7%)	1 (0.5%)	6 (2.7%)	
Duration in U.S. [n (%)]				
<10 years	63 (15.6%)	36 (19.9%)	27 (12.1%)	0.094
10–20 years	137 (33.9%)	53 (29.3%)	84 (37.7%)	
20+ years	182 (45.1%)	81 (44.7%)	101 (45.3%)	
N/A- Born in U.S	15 (3.7%)	8 (4.4%)	7 (3.1%)	
Missing	7 (1.7%)	3 (1.7%)	4 (1.8%)	
Country of birth [n (%)]				
U.S	15 (3.7%)	8 (4.4%)	7 (3.1%)	0.600
Outside of U.S	379 (93.8%)	170 (93.9%)	209 (93.8%)	
Missing	10 (2.5%)	3 (1.7%)	7 (3.1%)	
Ethnic group [n (%)]				
Chinese	254 (62.9%)	105 (58.0%)	149 (66.8%)	0.089
Korean	145 (35.9%)	75 (41.5%)	70 (31.4%)	
Other	1 (0.2%)	–	1 (0.4%)	
Missing	4 (1.0%)	1 (0.5%)	3 (1.4%)	
Know someone with HBV [n (%)]				
Yes	101 (25%)	30 (16.6%)	71 (31.8%)	0.001
No	231 (57.2%)	118 (65.2%)	113 (50.7%)	
Don't know	69 (17.1%)	32 (17.7%)	37 (16.6%)	
Missing	3 (0.7%)	1 (0.5%)	2 (0.9%)	
Have PCP [n (%)]				
Yes	314 (77.7%)	131 (72.4%)	183 (82.1%)	0.025
No	89 (22.1%)	49 (27.1%)	40 (17.9%)	
Missing	1 (0.2%)	1 (0.5%)	–	
Duration since last PCP visit [n (%)]				
<1 year	203 (50.2%)	78 (43.1%)	125 (56.1%)	0.069
1–5 years	94 (23.3%)	48 (26.6%)	46 (20.6%)	

Table 2 (continued)

	Combined n=404	Group A n=181	Group B n=223	p values
5–10 years	41 (10.1%)	18 (9.9%)	23 (10.3%)	
>10 years	65 (16.2%)	37 (20.4%)	28 (12.6%)	
Missing	1 (0.2%)	–	1 (0.4%)	
Insurance status [n (%)]				
Insured	338 (83.7%)	143 (79.0%)	195 (87.4%)	0.023
Not insured	66 (16.3%)	38 (21.0%)	28 (12.6%)	

Potential Barriers to Screening in Unscreened Participants (Group A)

When participants in Group A were asked about the greatest influence in their decision to not undergo screening, the most common reasons were: I have previously received the HBV vaccine (32.6%), I do not know where to go to get HBV screening (19.9%), I do not understand the benefits of getting screened (14.4%), I feel well and do not think I have liver problems (12.7%), and I do not have any risk factors (11.6%).

Among this group, 40.3% indicated they had been vaccinated against HBV, 44.2% indicated they had not been vaccinated, and the others were unsure. Of those who said they had not been vaccinated, the most common reasons were: I feel well and do not think I need the vaccination (22.7%), I do not understand the benefits (21%), and I do not feel I need the vaccine because I have no risk factors (20.4%). No participants selected “I am unable to afford the HBV vaccine.”

Provider-Related Barriers

Only 11% said their PCP has ever brought up screening, while 57% said their PCP had not, and others were unsure. More than half (59.7%) of Group A participants said they would undergo screening if it was recommended by their physician.

Patient-Related Barriers

Among the participants in this group, 16.6% said they knew someone with HBV, and majority (65.2%) indicated they would be more likely to be screened for HBV if they knew a family member or friend with HBV. Knowledge score and attitude if found to be infected for these participants are presented in the respective sections.

Resource-Related Barriers

Most participants (79%) in this group have some form of health insurance and 72.4% have a PCP. Less than half

(48.1%) said they would undergo screening, even if it were necessary and free.

Factors Influencing Screening in the Screened Participants (Group B)

Among Group B, most (60.6%) had HBV screening more than 10 years ago. Almost half (48%) of these participants indicated their family doctor/PCP had the greatest influence in their decision to be screened, and 70.9% said they were screened at a doctor’s visit. Most participants reported they heard about HBV screening from their family doctor/PCP (60.1%), family/friend (48.4%), and health fairs (23.3%). Less than 10% stated they heard about screening from a job or immigration requirement, and less than 10% said they heard about HBV screening from health brochures, magazines, TV, radio, or the Internet.

Follow Up Care After Screening in Group B Participants

More than half of the participants (58.4%) in Group B did nothing after they were screened, while 28.8% received HBV vaccine, and 6.3% followed up with their doctors. Less than half (41.7%) of this group said they know and understand the test results, 35% said they know the results but do not understand the meaning of those results, and 17.9% said they do not know the results and are not being monitored by a doctor.

Of the 223 participants in Group B, 25 (11.2%) said they tested positive for HBV. Eleven (44%) are currently being monitored by a doctor, and six (24%) are currently receiving treatment. Thirteen (52%) participants indicated they have disclosed their HBV status to their immediate family members, eleven (44%) have disclosed to their close friends, and eight (32%) have disclosed to their employers. Of those who have disclosed their status, none regret their decision in doing so. No participants reported feeling discriminated because of their HBV status, while two participants feel ashamed about their HBV status.

Fig. 1 Knowledge of HBV transmission. **a** Shows how Group A and Group B participants responded to true and false questions regarding knowledge of HBV transmission. Knowledge of HBV disease management and progression. **b** Shows how Group A and Group B participants responded to true and false questions regarding knowledge of disease management and progression. Response if found to be Infected. **c** Shows how Group A and Group B participants responded to yes and no questions regarding attitude if found to be infected

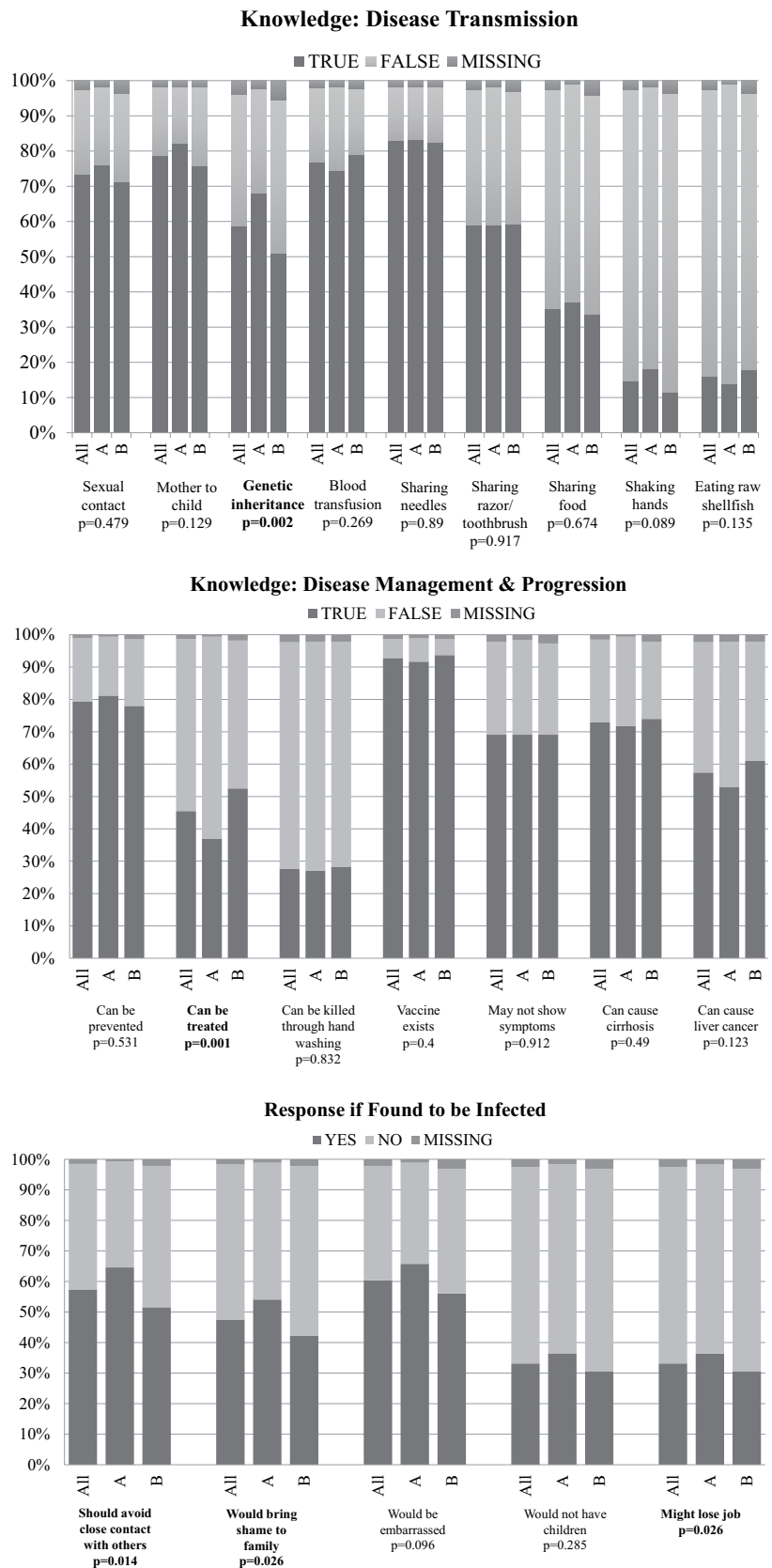


Table 3 Linear regression analysis predicting knowledge score

Predictors	B ^a	95 % CI	p value
Knowing someone with HBV	0.905	(0.251, 1.560)	0.007
Having a PCP	0.697	(−0.299, 1.692)	0.169
Duration since last PCP visit	0.167	(−0.196, 0.530)	0.366
Age	−0.007	(−0.034, 0.020)	0.602
Korean Ethnicity	−0.448	(−1.098, 0.201)	0.176
Married	0.075	(−0.602, 0.753)	0.827
Attitude Score	−0.054	(−0.241, 0.133)	0.568
Education	0.422	(0.004, 0.840)	0.048
R ^{2b}	0.050		

Values in bold represent predictors that were statistically significant

^aThe unstandardized B coefficient shows the effect of each predictor on the dependent variable

^bR² shows the percentage of the variation in the dependent variable that can be explained by a linear relationship with the predictor

Table 4 Linear regression analysis predicting stigma score

Predictors	B ^a	95 % CI	p value
Having a PCP	0.649	(−0.005, 1.304)	0.052
Duration since last PCP visit	0.199	(0.005, 0.392)	0.044
Korean Ethnicity	0.883	(0.546, 1.220)	<0.001
Education	−0.362	(−0.583, −0.141)	0.001
Knowledge Score	−0.019	(−0.074, 0.036)	0.492
Having Health Insurance	−0.585	(−1.272, 0.101)	0.095
Know someone with HBV	0.102	(−0.247, 0.451)	0.566
R ^{2b}	0.181		

Values in bold represent predictors that were statistically significant

^aThe unstandardized B coefficient shows the effect of each predictor on the dependent variable

^bR² shows the percentage of the variation in the dependent variable that can be explained by a linear relationship with the predictor

HBV Knowledge

Responses to questions regarding HBV transmission and disease management in the two groups are shown in Fig. 1a, b. Responses in both groups are generally comparable. Most know HBV can be transmitted through needle sharing, sexual contact, or from mother to child, and not through shaking hands or eating raw shellfish. However, more than 50% in both groups indicated HBV is an inherited disease (A=68%, B=51.1%), and more than 30% in both groups indicated HBV can be transmitted by sharing food (A=37%, B=33.6%). Only 40% in Group A and 20% in Group B knew HBV can be transmitted through sharing razors and toothbrushes (Fig. 1a).

More than 90% in both groups know there is a vaccine for HBV, 79.2% know HBV can be prevented but only 45.5% know HBV can be treated. While more than 70% in both groups know HBV can lead to cirrhosis, fewer know HBV can cause liver cancer (A=53%, B=61%) (Fig. 1b).

Median overall knowledge score, out of 16, was 11 (range=0–16) in Group A and 12 (range=0–16) in Group B (p=0.003).

When comparing responses between groups A and B, having correct knowledge that HBV is not genetically inherited (p=0.002) and HBV can be treated (p=0.001) were associated with having been screened for HBV.

Multiple linear regression analysis was performed to determine predictors of total knowledge score. Knowing someone with HBV (p=0.007) and higher education level (p=0.048) were found to be significant predictors for higher total knowledge score while having a PCP, interval since last PCP visit, age, ethnicity, marital status, and stigma score were not (Table 3).

Attitude If Found to be Infected

Responses to questions regarding a participant’s response if he or she were found to be infected with HBV are shown in Fig. 1c. Approximately half of participants in both groups

indicated if they were found to be infected with HBV, they would avoid close contact with others (A=64.6%, B=51.6%), they might bring shame to their family (A=54.1%, B=42.2%), and they would be embarrassed (A=65.8%, B=56.1%). Additionally, more than 30% indicated they would not have children or might lose their job.

When comparing responses between groups A and B, responding yes to the following if found to be infected were associated with not having been screened for HBV: I would avoid close contact with others ($p=0.014$), I would bring shame to my family ($p=0.026$), and I might lose my job ($p=0.026$).

Multiple linear regression analysis was performed to determine predictors of stigma score. Having seen a PCP recently ($p=0.044$), ethnicity (Chinese vs. Korean, $p<0.001$), and having a higher education level ($p=0.001$) were found to be significant predictors for lower stigma score, having a PCP showed a trend while having health insurance, knowledge score, and knowing someone with HBV were not predictive of stigma score (Table 4).

Predictors of HBV Screening

Logistic regression analysis was performed to determine predictors of screening. Knowing a family member or friend with HBV was the only significant predictor of screening status, with odds ratio and 95% confidence interval of 2.41 (1.44–4.03) ($p=0.001$). Duration of stay in the U.S., ethnicity, having a PCP, having health insurance, knowledge score, stigma score, and interval from last PCP visit were not significant predictors of screening (Table 5).

Discussion

In this survey study of 404 Asians conducted in Asian restaurants, grocery stores, churches, and community centers in Southeast Michigan, we found that 55.2% of those who completed the survey had been screened for HBV. Other studies on Asian Americans found screening rates ranging from 28 to 66% [17–22]. The HBV screening rate in our study is higher compared to studies in similar settings in Illinois, Philadelphia, New York, New Jersey, and Hawaii, but lower than what was found in California and Georgia.

Previous studies found health insurance status, having a PCP, sex, education level, understanding the seriousness of HBV infection contribute to HBV screening in the Asian American population [12, 15, 20, 29]. Studies in the U.S., Canada, China, and the Netherlands have also found HBV knowledge and stigma to be associated with HBV screening [16, 18, 19, 30–32]. These findings indicate barriers to HBV screening can occur at multiple levels: patient, provider, and resource.

Table 5 Logistic regression analysis predicting HBV screening

Predictors	95% CI	OR	p value
Duration in the U.S.			
Born in the U.S.	–	1	–
<10 years	(0.404, 5.290)	1.461	0.563
10–20 years	(0.943, 10.677)	3.173	0.062
>20 years	(0.785, 8.808)	2.630	0.117
Duration since last PCP visit			
<1 year	–	1	–
1–5 years	(0.420, 1.291)	0.736	0.285
5–10 years	(0.453, 2.154)	0.987	0.975
>10 years	(0.289, 2.148)	0.788	0.642
Having a PCP			
No	–	1	–
Yes	(0.463, 3.268)	1.230	0.678
Ethnicity			
Chinese	–	1	–
Korean	(0.479, 1.282)	0.784	0.332
Know someone with HBV			
No	–	1	–
Yes	(1.442, 4.028)	2.41	0.001
Have health insurance			
No	–	1	–
Yes	(0.474, 3.231)	1.238	0.663
Knowledge score ^a	(0.935, 1.092)	1.010	0.794
Attitude score ^a	(0.759, 1.008)	0.875	0.065

Values in bold represent predictors that were statistically significant

^aHBV knowledge score and HBV stigma score used as continuous variable

Stigma and unfamiliarity with the disease can be major patient-related barriers to HBV screening. One study showed unscreened participants were more likely to say they would be embarrassed or bring shame to their family if diagnosed with HBV [15]. Our study shows similar responses. Perhaps these feelings are rooted in Asian culture, where disease can be seen as undesirable and burdensome. This is especially relevant in the context of HBV, which can be transmitted to others and result in serious health consequences. Indeed, a recent study by our group found more than half of patients with chronic HBV infection in Beijing felt they bring trouble to their family and one-third felt they were not as desirable as spouses although responses from the uninfected controls showed their perception of persons with chronic HBV infection is less negative [33]. Previous studies have found knowing someone with HBV is associated with increased likelihood of HBV screening [27, 30]. Our findings were similar with 65.2% of unscreened participants saying they would be more likely to be screened if they knew a family or friend with HBV. Knowing someone with HBV clarifies misconceptions about the disease, humanizes the affected,

and can reduce negative attitudes brought on by cultural beliefs.

Lack of knowledge regarding the benefits of screening can also be a patient-related barrier. Prior studies showed unscreened participants were more likely to think nothing can be done to prevent cancer from HBV [15, 31]. We found unscreened participants are more likely to believe no HBV treatments are available, and HBV is genetically inherited. Moreover, many of our unscreened participants did not understand the benefits of screening. They were also concerned about vaccination side effects, and did not think they needed to be screened or vaccinated because they had no symptoms or had no risk factors. Some studies found HBV screening is associated with education level; this was not the case in our study possibly because of the overall high education level of our participants. Despite the high level of education, there were many misconceptions among our participants; thus efforts to raise awareness and to correct misconceptions are needed. Culturally sensitive community outreach and publicity campaigns such as the Jade Ribbon campaign have shown tremendous success in increasing HBV vaccination rates among at risk Asian Pacific Islanders [23]. The B Free Campaign in New York has also been successful in reaching out, educating the community, and increasing screening rates [34]. The Hep B Free campaign in San Francisco is one of the most successful programs in reducing stigma and increasing HBV awareness, knowledge, screening and vaccination. This program is unique in that public figures stepped forward to disclose their infection status putting a human face to the disease and the local government championed the campaign [24]. In 2014, in Michigan alone, 28.7% of new chronic HBV cases were from the Asian Pacific Islander population [35]. The Midwest Asian Pacific Islander population can benefit from similar community outreach programs and government support.

Providers can play a key role in health screening. Although CDC and the United States Preventive Task Force have provided guidelines on HBV screening, it is up to physicians—PCPs—to discuss and recommend screening. The majority of our unscreened participants stated their PCP had not previously brought up HBV screening. Lack of recommendation by PCPs may be related to provider knowledge about HBV and guidelines for screening, or simply due to lack of time during busy clinic visits. One study found less than one-fifth of providers, who had predominantly Asian patients, screened their patients for HBV [36]. A key component in improving provider knowledge is through Continuing Medical Education programs and updating physicians on HBV guidelines. In addition to provider education, simpler measures to identify at risk persons for screening and to order the appropriate screening tests are needed to increase uptake of screening. The introduction of

birth cohort screening regardless of other risk factors and the use of electronic health record alerts and pre-specified order sets have greatly facilitated hepatitis C screening [37, 38]. A similar approach can be adopted for HBV screening, and electronic health records can help by capturing country of birth in the demographics section.

Although our study did not directly demonstrate resource-related barriers such as having insurance and having a PCP to be significant predictors of screening, these barriers should not be overlooked in the general population. In our study, most participants had health insurance, majority of the screened participants stated they were screened at a doctor's visit, and none of the unscreened participants said inability to afford screening was the reason why they had not been screened. However, the importance of community-based free screening programs would be more important for those who do not have health insurance or a PCP. Other studies have shown lack of insurance is a significant barrier in follow up and treatment of chronic HBV [12, 39]. Improving access to health care through patient advocacy programs, and increased publicity and frequency of free screening events are all possible solutions to addressing resource-related barriers.

While screening is the most important first step in preventing HBV-related cirrhosis, liver cancer and mortality, benefits of screening can materialize only if the results and meaning of those results are clearly explained to persons screened and follow up care, such as vaccination of those susceptible to infection and monitoring and treatment of those who are infected, are provided. In our study, many participants stated they did not understand the results of their screening. PCPs should discuss screening results and make sure their patients understand the results, implement follow up care, and refer patients to specialists if needed.

Limitations

There are several limitations to our study. Our study included a convenience sampling with most participants residing in suburban communities with higher education levels. Most participants were Chinese or Korean Americans and half were enrolled at churches. Thus, the results of our study may not be generalized to other Asian ethnicities or to Asians with different socioeconomic status or educational level. Additionally, approximately 15% of our participants completed a non-English survey. Although translations were checked for accuracy, there still remains the possibility of misinterpretation. Our study population was small and highly selected, making it difficult to draw conclusions on HBV screening rate among all Asians living in the Midwest. However, our study was conducted in many different settings within the community, and the findings provide a

glimpse into motivators and barriers to HBV screening that are actionable.

Conclusion

Our study shows the low HBV screening rate among Asian Americans in Southeast Michigan is a multifaceted issue. In order to address the barriers that contribute to this health disparity, it is important to understand the cultural context of HBV and engage in open dialogue and implement culturally appropriate strategies to promote HBV screening. Implementing a culturally sensitive and appropriate community campaign, similar to those in California and New York, can be successful in increasing knowledge, awareness, and screening rates. Additionally, physicians should be reminded of current guidelines on HBV screening and understand their role in providing culturally competent care. HBV can cause liver failure and liver cancer, but it can be prevented and also be treated.

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Compliance with Ethical Standards

Conflict of interest ASL has received research grants from Bristol-Myers Squibb and Gilead. SC and EL have no conflicts of interest to declare.

Human Participants All human participants verbally and voluntarily consented to be a part of this study. This study was approved by the University of Michigan Institutional Review Board and was granted exemption.

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