Racial Disparities in Hepatitis B Infection in Ohio: Screening and Immunization Are Critical for Early Clinical Management

Ranjita Misra, PhD, CHES, FASHA, Karen Jiobu, BA, MA, DLM (ASCP),† Johnathan Zhang, MD,‡ Qihui Liu, MD,‡ Feng Li, MD,‡ Robert Kirkpatrick, MD,§ and Jason Ho, MD‡*

Objective: Chronic hepatitis B virus (HBV) infection and liver cancer mortality represent a neglected health disparity among Asian Americans. The purposes of this study were to compare the prevalence of hepatitis B among a diverse group of 1311 Ohioans in Franklin County, OH (85% Asians, 7.5% African Americans, and 6.5% whites) and to improve access to care for high-risk Asian adults through advocacy and policy changes.

Research Design and Methods: The Asian subgroups comprised of Chinese, Filipino, Asian Indian, Pakistani, Vietnamese, Korean, Laotian, Indonesian, Japanese, Cambodian, Thai, and Malaysian nationalities. The HBV screening was completed at health fairs, restaurants, churches, and temples from 2006 to 2011.

Results: The prevalence of HBV infection (9.5% vs 5%) and family history of liver cancer was significantly higher among Asians than other racial ethnic groups ($P = 0.001$). Cambodian, Vietnamese, and Chinese participants were disproportionately infected with the virus compared with other Asian subgroups ($P < 0.001$). Advocacy and policy changes for resources allowed vaccine-eligible Asians included as "high risk" group to receive free vaccinations at the health department. However, although vouchers were provided to vaccine-eligible Asian adults, compliance in getting vaccinated was very low (11%). Common barriers for compliance were lack of time and knowledge of completing the 3 shot series, low English proficiency, and fear of adverse effects.

Conclusions: Outreach education may use community liaisons to improve screenings, education, and vaccination/treatment. A hepatitis free clinic was established in 2009 to provide culturally and linguistically appropriate treatment for low-income Asian Americans in Franklin County, OH.

Key Words: Asian Americans, hepatitis B, screening, immunization

(*J Investig Med* 2013;61: 1121–1128)

Chronic hepatitis B virus (HBV) infection, one of the most serious but frequently neglected racial and ethnic disparities, remains an important cause of acute and chronic liver disease globally and in the United States.[1] Chronic infection with HBV is a major cause of morbidity and mortality worldwide.[2] The World Health Organization estimates that one third of the world's population has been infected with hepatitis B and 1 in 20 people (350–370 million) has chronic infection.[3] Within the United States, The Centers for Disease Control and Prevention estimates that chronic HBV affects 1.2 to 1.4 million Americans, with recent data suggesting up to 2.2 million Americans are infected with viral infections.[4] Half of the infected individuals are Asian Americans encompassing more than 50 different ethnic groups (major categories are Chinese, Koreans, Filipinos, South Asians, Cambodians, Japanese, and Southeast Asians).[5–9] Among foreign-born Asian Americans in the United States, the prevalence of chronic HBV is consistently found to be approximately 10%.[10–13] By contrast, the prevalence in the overall US population is below 0.5% and among non-Hispanic whites, it is below 0.2%.[14] Asian Americans most chronically infected with HBV are born or have parents who were born in HBV-endemic regions in East and Southeast Asia.[15] Additionally, despite the availability of the hepatitis B vaccine since 1982, vaccination rates are low among many immigrant Asians in the United States, leaving already high-risk populations vulnerable to subsequent HBV infection.

Chronic HBV infection leads to a 100-fold greater risk to develop liver cancer and is the leading cause of liver cancer among Asian Americans.[16] The 5-year survival rate for liver cancer is below 10%, and Asian Americans are 2 to 3 times more likely to develop and die from liver cancer than whites.[10,17,18] Without proper medical attention and treatment, individuals with chronic HBV infection have a 25% risk of death from liver cancer or cirrhosis.[3]

Primary and secondary prevention of chronic HBV can be achieved through early-life vaccination, public education, and screening to reduce disparities. Screening for HBV is especially critical for Asian Americans because patients are asymptomatic until advanced liver diseases, are commonly unaware of their infection[19] or significant risks associated with chronic HBV, and do not undergo screening or vaccinate their children.[20] However, there is a shortage of population-based data on trends and patterns in the prevalence of chronic HBV in OH. Additionally, current national surveys have not assessed HBV infection in different Asian subgroups because multiple Asian subgroups are generally aggregated into the broad category of Asian Americans.[5] Hence, the purposes of this study were to (1) describe the prevalence of chronic HBV infection among 1311 racially diverse adults in Franklin County, OH; (2) report barriers to vaccination among vaccine-eligible respondents who were provided with vouchers; (3) advocate for policy changes to improve access and establishment of a hepatitis B free clinic to provide follow-up care for uninsured patients.

MATERIALS AND METHODS

Study Design

A cross-sectional study was completed in Columbus, OH and its surrounding areas in Franklin County over the past

From the *Public Health Practice, Social and Behavioral Health Sciences, School of Public Health, West Virginia University, Morgantown, WV; †Health Through Action, Ohio Asian American Health Coalition, Columbus, OH; National Hepatitis B Task Force Board, Miller, NE; ‡Ohio State University (Medical graduates); and §Division of Gastroenterology, Hepatology and Nutrition, Ohio State University, Columbus, OH.

Received January 21, 2013, and in revised form April 18, 2013.
Accepted for publication May 28, 2013.

Reprints: Ranjita Misra, PhD, CHES, FASHA, School of Public Health, 3830, Health Science Center, 1 Medical Dr, West Virginia University, Morgantown, WV 26506. E-mail: ramisra@hsc.wvu.edu.

Supported by grants from the Asian and Pacific Islander Forum (APIAF) and the Kellogg Foundation and in part by Area Health Education Center Program, Ohio Commission of Minority Health.
The authors declare no conflicts of interest.

ISSN: 1081-5589
DOI: 10.231/JIM.0b013e3182a70f10

5 years (2006–2011). Data were collected through collaborations of multiple community agencies, a medical center, and a medical student organizations: The Asian Festival Health and Wellness Pavilion, part of the Ohio Asian American Health Coalition, the Ohio State University Asian Pacific American Medical Student Association (APAMSA), Asian American Community Services (AACS), Ohio State University Medical Center Community Development, and the Columbus Public Health Department (CPHD). Data collection survey instrument and serologic tests were standardized across all data collection sites. Hepatitis B virus screening was completed at health fairs, restaurants, public health clinic, churches, and temples to represent the diverse Asian subgroups. Written informed consent was obtained from all subjects before their participation. Approval was obtained from the Institutional Review Board of the Ohio State University.

Sample Size

The sample comprised of 1311 Ohioans 18 years and older (85% Asians, 7.5% African Americans, and 6.5% whites) in Franklin County, OH. The Asian subgroups comprised of Chinese, Filipinos, Asian Indians, Pakistanis, Vietnamese, Koreans, Laotians, Indonesians, Japanese, Cambodians, Thais, and Malaysians.

Recruitment

Bilingual trained community liaisons (also referred to as community health advocate for community health worker [CHW]) and medical students from 8 different Asian American subgroups (Chinese, Korean, Asian Indian, Bangladesh, Laos, Cambodian, Japanese, and Filipino) helped in recruiting underserved and hard-to-reach Asian subgroups in Franklin County for screenings, survey data collection, and follow-up phone calls. Emphasis was placed on liaison fluency and their effective communication with these targeted Asian subgroups. Many liaisons were well known and trusted in their community, which improved recruitment and data collection. All participants that agreed to participate signed the informed consent form before data collection.

Study Procedures

This study combined survey and serologic data. The liaisons and medical students conducted face-to-face interviews owing to the low English language proficiency of some respondents (as per participant's convenience) or aided in completion of the surveys before the health fairs or serologic tests. Trained phlebotomists drew blood samples, which were analyzed in a Clinical Laboratory Improvement Amendments (CLIA)-certified reference laboratory. Translated brochures, forms, and letters were provided to the respondents (Figs. 1 and 2). Results of blood tests, along with their interpretation by a physician, were provided free of cost.

Measures

Survey data included information on demographics, knowledge of HBV, prior treatment and infection, medical and family history of liver cancer, and results of 2 HBV serologic tests: hepatitis B surface antigen (HBsAg) and hepatitis B surface antibody. Demographic information included age, years lived in the United States, race/ethnicity, education, income, family history of liver cancer, and medical insurance for the study population (Table 1).

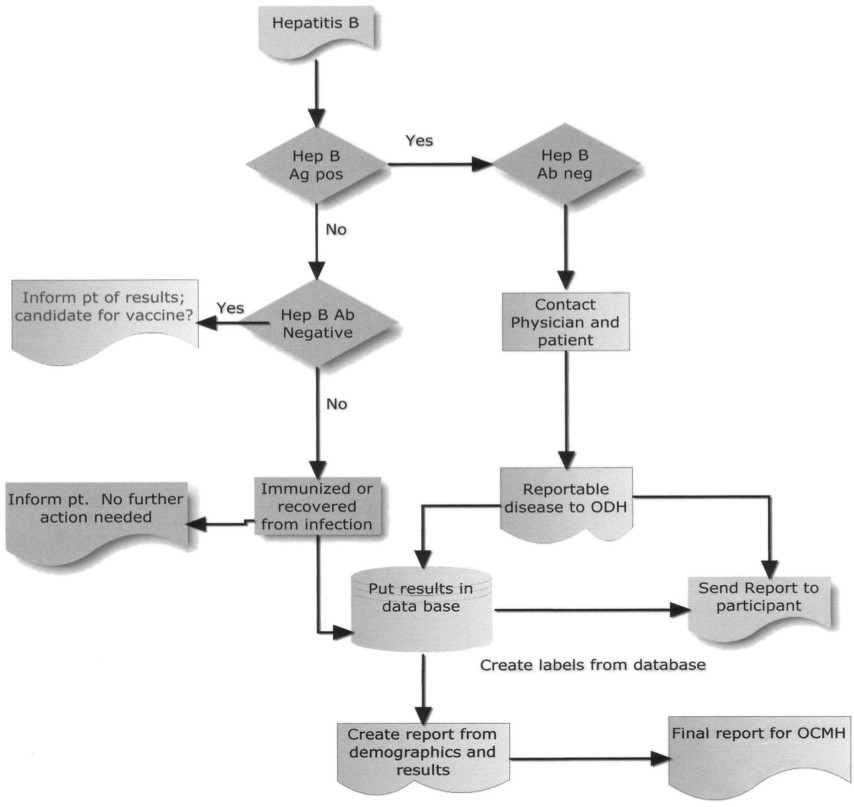

FIGURE 1. Hepatitis B result reporting.

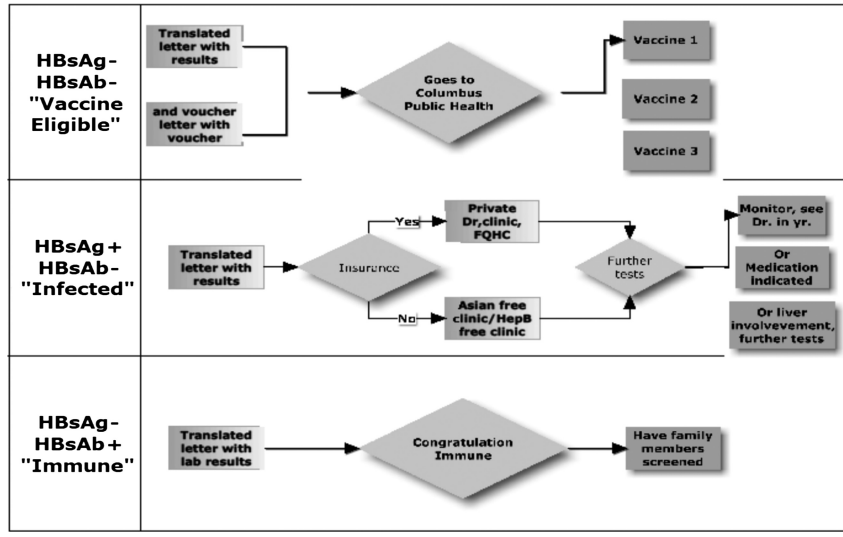

FIGURE 2. Hepatitis B surface antigen/antibody flowchart.

Participants were categorized into 3 categories based on their blood results: immune, vaccine eligible, or infected with the virus. Results were sent to all participants; vaccine-eligible individuals were also sent free vouchers by the CPHD.

Statistical Analysis

Chi-square tests were used for crude comparisons of the prevalence of HBsAg and hepatitis B surface antibody (ie, hepatitis B infection and vaccine status) across racial and Asian subgroups. Prevalence (%) of chronic HBV infection was obtained by dividing the number of cases with the total number of Asian participants in each racial group/subgroup. A multivariate logistic regression analysis was performed to estimate the odds ratio (OR) with 95% confidence intervals (CIs) of being chronically infected or being unprotected. Participants who tested positive for HBV were excluded from the analysis of associations with risk of HBV susceptibility. Logistic regression model was adjusted for known confounders such as family history of cancer, socioeconomic status, educational level, access to care (have medical insurance), being born in an HBV-endemic county, sex, age, and number of years lived in the United States. Data analysis was done using the SPSS software.

RESULTS

The mean ± SD age was 50.72 ± 14.55 years. Most of the respondents were women (57.1%), Asian Americans (82.0%), high school or lower educational level (32%), and reported that English is not their primary language of communication (79.1%). Among those who responded to the question on education, income, and access to care, 53% indicated less than $25,000 income, 59.9% had a high school diploma or below or vocational training, and 34.3% had some type of health insurance. The mean ± SD number of years lived in the United States and the number of family members in the household was 18.94 ± 15.87 years and 3.3 ± 2.0, respectively.

Prevalence of Chronic HBV Infection and Susceptibility

The prevalence of HBV infection in the 1311 adults screened was 5.5 % (Table 1). First-generation Chinese and Southeast Asian immigrants (ie, individuals from Burma, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Myanmar, Singapore, Thailand, and Vietnam) had significantly higher rates of HBV infection than the other Asian subgroups and those born in the United States of America. Most of the chronically infected participants (79.2%) stated that they were never tested for HBV, and never diagnosed or vaccinated against HBV. Thirteen percent of the chronically infected had a family history of HBV, and 8.3% were currently living with a family member infected with the virus. Participants born in SE Asia (eg, Burma, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Myanmar, Singapore, Thailand, and Vietnam [29.2% positive]) were 21 times more likely to be chronically infected and Chinese Americans (23.6% positive) 17 times more likely to be chronically infected than those born in the United States (1.4% HBsAg positive).

Of the participants who were not chronically infected, half of the respondents (50.6% [627/1239]) lacked protective antibodies against HBV and were therefore likely susceptible to future infection (Table 1). Participants born in China and Southeast Asia had higher risk of being unprotected against HBV (10.4% and 12.0% anti-HBs–negative, respectively; $P < 0.001$; Table 1) than other groups. After adjustments for age and sex, participants born in the United States had a lower risk of being unprotected against HBV than those born in China, Southeast Asia, and Korea (Table 2).

Associations Between Selected Respondent Characteristics and Risk of HBsAg Seropositivity and Seronegativity

The odds of being immune to hepatitis B decreased linearly and significantly with age. Respondents who were 70 years of age and older had 46% lesser odds of being immune compared to those younger than 30 years of age (OR, 0.54; 95% CI, 0.32–0.91).

Although the risk of being unprotected against HBV did not have a linear age trend, respondents aged 30 to 39 years (OR, 2.03), 40 to 49 years (OR, 2.11), and 50 to 59 years (OR, 2.03) had twice the odds of being vaccine eligible than their older or younger counterparts (Table 2). No sex differences were noted in the prevalence or risk of HBV infection.

Participants who reported no family history of HBV infection were 78% less likely to be infected (OR, 0.22; 95% CI,

TABLE 1. Prevalence of HBsAg Seropositivity and HBsAb Seronegativity Among Participants by Selected Characteristics

Characteristics	Total Number	HBsAg Positive (Chronically Infected)			HBsAg Negative and HBsAb Negative (Unprotected or Vaccine Eligible)*			HBsAg Negative and HBsAb Positive (Immune)*		
		Number	Percent	*P*	Number	Percent	*P*	Number	Percent	*P*
Overall	1311									
Age, yrs	1302	72	5.5		627	48.2		603	46.3	
<30	114	9	7.9		43	37.7		62	54.4	
30–39	157	12	7.6		82	52.2		63	40.1	
40–49	262	17	6.5		129	49.2		116	44.3	
50–59	309	10	3.2		155	50.2		144	46.6	
60–69	251	14	5.6		124	49.4		113	45.0	
≥70	116	5	4.3		55	47.4		56	48.3	
Missing	93	5	5.4	0.373	39	41.9		49	52.7	0.259
Sex	1294									
Male	553	28	5.1		267	48.3		258	46.7	
Female	741	44	5.9		358	48.3		339	45.7	
Missing	17	2		0.290	2	0.1	0.518	10	1.4	0.395
Ethnicity	1251									
White	76	0	0		66	86.8		10	13.2	
African American	80	3	3.8		51	63.8		26	32.5	
Asian	1077	67	6.2		476	44.2		534	49.6	
Other	18	0	0	0.007	13	72.2	<0.001	5	27.8	<0.001
Country of birth	1302									
China	282	17	7.7		65	29.3		140	63.1	
Southeast Asia	272	30	7.7		126	46.3		125	46.0	
Cambodia	111	11	12.8		21	38.2		30	54.5	
Laos	71	2	2.8		46	64.8		23	32.4	
Vietnam	79	11	13.9		20	25.6		47	60.3	
Other SE Asia†	152	6	3.4	0.05	104	50.2	<0.001	90	43.5	0.003
South Asia‡	64	0	0		49	76.6		15	23.4	
USA	124	1	.8		94	75.8		29	23.4	
Korea	65	0	0		24	36.9		41	63.1	
Japan	18	1	5.6		17	94.4		0	0	
Other§	29	13	14.6		34	38.2		42	47.2	
Missing	9	19	4.2	<0.001	218	34.8	<0.001	211	47.1	<0.001
Ever tested for hepatitis B (self-report)	1302									
Yes	118	15	12.7		48	40.7		55	46.6	
No	479	25	5.2		226	47.2		228	47.6	
Unknown	705	32	4.5	0.001	353	50.1	0.145	320	45.4	0.754
Ever diagnosed with hepatitis B (self-report)	1302									
Yes	19	1	5.3		7	36.8		11	57.9	
No	334	7	2.1		179	53.6		148	44.3	
Unknown	949	64	6.7	0.006	441	46.5	0.050	444	46.8	0.439
Ever vaccinated against hepatitis B (self-report)	1302									
Yes	87	4	4.6		37	42.5		46	52.9	
No	481	36	7.5		221	45.9		224	46.6	
Unknown	734	32	4.4	0.061	369	50.3	0.186	333	45.4	0.410
Family history of hepatitis B (self-report)	1302									
Yes	34	9	26.5		11	32.4		14	41.2	
No/Unknown	476	24	5.0		222	46.6		230	48.3	
Unknown	792	39	4.9	<0.001	394	49.7	0.098	359	45.3	0.487

TABLE 1. *(Continued)*

Characteristics	Total Number	HBsAg Positive (Chronically Infected)			HBsAg Negative and HBsAb Negative (Unprotected or Vaccine Eligible)*			HBsAg Negative and HBsAb Positive (Immune)*		
		Number	Percent	*P*	Number	Percent	*P*	Number	Percent	*P*
Living with a family members with HBV	1302									
Yes	15	6	40.0		2	13.3		7	46.7	
No	291	9	3.1		138	47.4		144	49.5	
Unknown	996	57	5.7	<0.001	487	48.9	0.023	452	45.4	0.466

*Excluded the 72 chronically infected individuals with HBV.

†For the χ^2 test.

‡Burma, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Myanmar, Singapore, Thailand, and Vietnam.

§India, Pakistan, Sri Lanka, Bangladesh, Nepal, and Maldives.

¶Includes Taiwan, Syria, Senegal, Peru, Mexico, Iran, Hong Kong, Haiti, Ghana, and Syria.

HBsAb indicates hepatitis B surface antibody.

0.08–0.66). Similarly, individuals who did not currently live with family members infected with HBV were significantly less likely (80%) to be infected (OR, 0.20; 95% CI, 0.05–0.82). Participants born in Southeast Asia and China had significantly higher odds of being chronically infected or lacked protective antibodies than those who were born in the United States, South Asia, Korea, and other countries. Individuals from China (OR, 3.14; 95% CI, 1.68–5.86) and Korea (OR, 2.89; 95% CI, 1.35–6.16) also had higher risk of being immune to hepatitis B.

There was a weak association between chronically infected/unprotected risk for HBV with lack of access to health care (health insurance), English language proficiency, ever tested and/or vaccinated for HBV. People whose primary language was not English were 58% less likely of being vaccine eligible (OR, 0.42; 95% CI, 0.27–0.64) and 115% more likely of being immune (OR, 2.15; 95% CI, 1.40–3.31). Additionally, individuals who reported no prior vaccination against HBV were 4 times more likely to be chronically infected with HBV as those who reported prior vaccination for HBV (OR, 3.59; 95% CI, 1.07–11.96).

Advocacy and Policy Changes to Improve Vaccination and Follow-up Care for Uninsured Asian Americans

Although half of the participants were vaccine eligible, anecdotal evidence showed that compliance rate was very low in 2006–2008. One of the primary reasons identified was lack of free immunization at the CPHD, as Asian adults were not considered at high risk. Advocacy for the Asian adults in 2007–2008 lead to expansion of existing policy; and since 2008, vaccine-eligible Asian adults receive free vaccinations at the CPHD. Education to community liaisons improved awareness of the transmission, prevention, symptoms, risks, and occurrence of chronic hepatitis B. Furthermore, collaboration of Asian Festival's Health and Wellness committee with medical student organizations (eg, APAMSA) and community organizations (eg, AACS) in 2009 led to improved screening rates, immunization through free voucher systems for infected individuals, and resources for this high-risk ethnic group.

Barriers to HBV Vaccination Among Vaccine Eligible Asian Americans

Although HBV screening results and free vouchers for vaccination at the Columbus Health Department were sent to vaccine-eligible Asian participants, only 12% Asian Americans were compliant in their follow-up vaccination in 2009–2010. Hence, random phone calls (n = 35) were made by the community liaisons to investigate the low vaccine rate in vaccine-eligible Asians who participated in the hepatitis B screenings. Forty-three percent reported that they had received the first hepatitis B vaccination, but only 21% had completed the full 3-part series recommended for immunity. Time commitment, refusal of vaccination due to lack of perceived need, departure from the country, transportation difficulties, and lack of understanding of the hepatitis B letter were cited as barriers. Several participants (21%) had returned to their countries of origin, resulting in no or incomplete vaccination. None of the Laotian participants completed the vaccination, uniformly stating they had not known about the voucher that was enclosed in the letter.

DISCUSSION

This is the first community-based study that compared HBV infection among Asian American subgroups, non-Hispanic whites and blacks in central Ohio. Our results validate higher rates of chronic HBV among Asian Americans compared to non-Hispanic whites and blacks in Franklin County, OH. Although the prevalence of HBV infection in the United States (0.34%) has stayed mostly unchanged in the past 2 decades,[21] chronic HBV infection among Asian Pacific Islanders (APIs) in large cities such as New York, San Francisco, Chicago, and Philadelphia show rates of 10% to 15%,[22,23] confirming a neglected health disparity for APIs in the United States. Asian Americans are a heterogeneous and growing racial/ethnic group that carry the burden for chronic HBV infection and its long-term sequel.[21] However, chronic HBV infection often goes undetected among the immigrants for a number of reasons including lack of access to health care and language and cultural barriers. Early detection and management of HBV infection are crucial to reduce complications such as chronic fatigue, chronic liver disease, cirrhosis, and liver cancer.[24–27]

Several prior studies have focused on HBV infection in large cities or selected Asian subgroups. Some examples are San Francisco's Chinese American adults (9% rate of chronic infection)[28]; a California longitudinal study (overall infection rate of 8.9%), with the highest rate among "Southeast Asia and Pacific Islanders" and Chinese respondents[10]; Vietnamese Americans in northern Virginia (infection rate was 9.3%)[29];

TABLE 2. Associations Between Selected Characteristics and the Risk of Being Infected, Immune, and Vaccine-Eligible Among Participants

Characteristic	HBsAg Positive (Infected)		HBs Ag Negative and HBsAb Negative (Vaccine Eligible)		HBsAg Negative and HBsAb Positive (Immune)	
Age, Yrs	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
<30	1.00	Reference	1.00	Reference	1.00	Reference
30–39	0.53	0.17–1.62	1.49	0.88–2.52	0.78	0.47–1.31
40–49	0.69	0.30–1.64	1.61	1.03–2.53	0.69	0.44–1.07
50–59	0.39	0.15–0.99	1.66	1.07–2.58	0.73	0.48–1.13
60–69	0.81	0.35–1.88	1.60	1.02–2.51	0.67	0.43–1.04
≥70	0.97	0.40–2.38	1.80	1.10–3.00	0.56	0.35–0.92
Sex						
Female	1.00	Reference	1.00	Reference	1.00	Reference
Male	0.85	0.52–1.37	1.00	0.80–1.25	1.04	0.83–1.30
Country at Birth						
USA	1.00	Reference	1.00	Reference	1.00	Reference
China	7.19	1.70–30.31	4.27	2.86–6.37	0.18	0.12–0.27
South Asia*	NC	NC	0.98	0.50–1.92	1.09	0.56–2.14
Korea	1.62	0.23–11.67	5.57	3.29, 9.44	0.18	0.10–0.30
Japan	5.00	0.43–58.04	NC	NC	5.67	0.73–43.85
Southeast Asia						
Cambodia	9.44	2.05–43.48	3.20	1.91–5.33	0.34	0.19–0.61
Laos	2.46	0.34–17.84	1.53	0.83–2.81	0.61	0.34–1.11
Vietnam	14.0	3.01–64.637	4.84	2.73–8.60	0.12	0.06–0.21
Other SE Asia†	3.49	0.70–17.57	2.39	1.48–3.84	0.38	0.24–0.61
Other‡	2.43	0.21–27.53	2.28	1.08–4.83	0.42	0.20–0.88
Insurance						
Yes	1.00	Reference	1.00	Reference	1.00	Reference
No	1.13	0.68–1.87	0.70	0.56–0.88	1.40	1.11–1.77
Is English your primary language?						
Yes	1.00	Reference	1.00	Reference	1.00	Reference
No	1.91	0.86–4.29	0.34	0.25–0.47	2.70	1.95–3.71
Ever tested with hepatitis B (self-report)						
Yes	1.00	Reference	1.00	Reference	1.00	Reference
No	0.33	0.17–0.65	1.27	0.84–1.94	1.10	0.72–1.66
Ever vaccinated against hepatitis B (self-report)						
Yes	1.00	Reference	1.00	Reference	1.00	Reference
No	3.06	0.94–9.91	1.09	0.68–1.77	0.71	0.44–1.14
Family history of hepatitis B (self-report)						
Yes	1.00	Reference	1.00	Reference	1.00	Reference
No	0.26	0.09–0.76	1.31	0.59–2.91	1.39	0.64–3.02
Family members infected with hepatitis B living in the household						
Yes	1.00	Reference	1.00	Reference	1.00	Reference
No	0.24	0.06–0.94	4.80	1.00–23.09	0.81	0.26–2.55

*India, Pakistan, Sri Lanka, Bangladesh, Nepal, Maldives.

†Burma, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Myanmar, Singapore, Thailand, and Vietnam.

‡Includes Taiwan, Syria, Senegal, Peru, Mexico, Iran, Hong Kong, Haiti, and Ghana.

NC indicates Not computed.

New York City's study a greater rate of infection among Chinese Americans (21.4%) compared to an overall infection rate of 14.8%.[30] Similarly, in Houston, TX, the overall rate of infection for Asian Americans was 13.6%.[31] Similar studies in Hawaii, Michigan, and Maryland have not only demonstrated higher rates of HBV infection for Asian Americans but also an alarmingly high rate of nonimmunized participants in all Asian subgroups.[10,30,32–35]

There has been an influx of minorities and the API community in the past 2 decades in the Midwestern states, and our results provide vital information on HBV infection and vaccine-eligible Asian Americans in Central Ohio so that resources can

be allocated toward programs that promote prevention and early detection/management for this high-risk group. Public health programs such as the free vaccination vouchers are necessary to prevent infection. Furthermore, public awareness and education programs particularly for the first-generation Asian Americans who emigrated from HBV-endemic countries can reduce the disparity in HBV infection in the United States.

Chinese, Vietnamese, and Cambodians were disproportionately burdened by HBV infection compared with other Asian subgroups and concur with prior studies.[21,22] China, Vietnam, and Cambodia have high HBsAg endemicity according to the World Health Organization[22]; and immigrants from these countries are projected to have high rates of infection. Our study did not have many participants from other endemic Asian countries such as Bhutan, Indonesia, and Burma but are likely to have high rates of HBsAg seropositivity. Hence, routine preventive care, screening, and vaccination can be implemented for immigrants from endemic Asian countries.

The high influx of API population to Central Ohio resulted in public-private partnership to address hepatitis B education, awareness, and screening to improve primary and secondary prevention of chronic HBV in this high-risk group in Franklin County. The Ohio Asian American Health Coalition in collaboration with the CPHD immunization program provided free hepatitis B vaccine for vaccine-eligible Asians in the local Asian American communities. Initially, the CPHD policies did not include Asian Americans as a high-risk group for free HBV vaccination. However, advocacy for vaccination and screening to reduce disparities based on national statistics, local community screening results, and a national initiative that allowed federal funds for immunizations for hepatitis B (2008–2010) resulted in Asian Americans being included in the criteria definition of "high risk group" by the Ohio Department of Health. Hence, vaccine-eligible Asian participants from the community screenings received free HBV vaccine vouchers along with their results. Furthermore, the cover letter was also translated to native languages identified by participants, and they were directed to go to the CPHD (Figs. 1, 2) immunization clinic for their free hepatitis B vaccine. This allowed the CPHD immunization program director to track the Asian participants who came for their follow-up vaccinations.

Free vouchers improved access to vaccinations among participants. However, it is important to ensure proper follow-up care for those chronically infected Asian immigrants who did not use their vouchers to receive their vaccinations. Our results showed cultural and language barriers to treatment and concur with prior studies.[36] For example, in a study among Chinese Americans, participants were less likely to get screened if they did not know a screening location, it was not suggested by their doctor, and the physician did not speak their language. The low number of participants who used their vouchers for vaccinations confirms that sending vouchers and information on how to receive the vaccinations is inadequate for this group, as it was left to them to take the initiative for making the trip to CPHD for receiving the vaccinations. Perhaps a more aggressive approach may result in higher vaccination rates, for example, if appointments for the vaccinations are made either in advance or participants are called for the same. Another approach might be to use outreach education using community liaisons and follow-up appointments for vaccination and treatment to improve compliance. Additionally, several of our Chinese and Korean American participants returned to their home countries without completing the vaccination series; and Laos had lower literacy rates (both in English and Laotian). Hence, efforts to contact vaccine-eligible participants via phone after sending them the results may be necessary. Community-based education and screening programs need to be culturally and linguistically tailored and involve health care providers to increase awareness of risks, reduce barriers to follow-up care, and increase vaccination rates among a growing Asian immigrant population in Ohio.

The cross-sectional design and self-reported information in this study makes it difficult to specify the reasons for the lack of vaccination and management of their hepatitis B. However, the literature suggests potential mechanisms to improve vaccination rates, for example, that should be investigated in future studies. We did not follow up on the vaccine-eligible and immune patients for their vaccination, monitoring, or management of the disease; it is a limitation of this study. Additional limitations include our inability to differentiate between patients who obtained immunity by previous infection or by vaccination; patients who obtained immunity from previous infection remain at risk for future reactivation (ie, after chemotherapy or immunosuppression). Although our follow-up phone calls were made to all vaccine-eligible and immune participants to encourage them to seek vaccination and care, we have partial data on how many sought care at the hepatitis B free clinic, with no information on whether many actually went for further care.

Further, the authors have no knowledge of how many of the patients with chronic HBV followed up with their primary care physician or hepatologist for further management.

The establishment of a hepatitis B free clinic in 2009 was a public-private partnership between the Ohio State University Medical Center Community Development, Asian American Community Services, and the Asian-American Community Service Council. It has greatly enhanced underinsured and uninsured Asian patients' access to care in the community and completion of the vaccine series. Care and services are provided by volunteer medical students and physicians from the Ohio State University Division of Gastroenterology, Hepatology and Nutrition. The clinic is currently held once every 3 months, and patients who needed medication and access to treatment using the drug assistance programs (Gilead's US Advancing Access program or Bristol-Myers Squibb Access Virology Patient Assistance Program) and referrals to local hospitals for liver ultrasounds to monitor for signs of liver damage, cirrhosis, or liver cancer.

ACKNOWLEDGMENTS

The authors thank Kathleen Koechlin, Sean Hubert, and Dr. Teresa Long for their review; and volunteers of the Asian Festival, AACS, APAMSA, and CPHD for their assistance in running the screening events.

REFERENCES

1. Kim WR. Epidemiology of hepatitis B in the United States. *Hepatology.* 2009;49(5 suppl):S28–S34.
2. Uddin G, Shoeb D, Solaiman S, et al. Prevalence of chronic viral hepatitis in people of south Asian ethnicity living in England: the prevalence cannot necessarily be predicted from the prevalence in the country of origin. *J Viral Hepat*. 2009;17(5):327–335.
3. WHO, *Hepatitis B Fact Sheet No. 204*. Geneva, Switzerland: World Health Organization; 2000.
4. Kowdley KV, et al. Prevalence of chronic hepatitis B among foreign-born persons living in the United States by country of origin. *Hepatology.* 2012;56(2):422–433.
5. US Department of Health and Human Services. Office of Minority Health. Asian Americans profile. Available at: http://minorityhealth.hhs.gov/templates/browse.aspx?lvl=2&lvlid=51. Accessed August 19, 2013.

6. Asian American Advertising Federation. Asian-American Market Profile. Available at: http://www.3af.org/3AFAsianUS0305.pdf. Accessed August 19, 2013.
7. Census Bureau. *American Community Survey*. US Census Bureau; 2000.
8. Choi Y. Diversity within: subgroup differences of youth problem behaviors among Asian Pacific Islander American adolescents. *J Community Psychol*. 2008;36(3):352–370.
9. Chen EW-C, Yoo GJ. *Encyclopedia of Asian American Issues Today*. Santa Barbara, CA: Greenwood Press; 2009.
10. Lin SY, Chang ET, So SK. Why we should routinely screen Asian American adults for hepatitis B: a cross-sectional study of Asians in California. *Hepatology*. 2007;46(4):1034–1040.
11. Chao SD. High prevalence of chronic hepatitis B (HBV) infection in adult Chinese Americans living in California. *Hepatology*. 2004;40(Suppl 1):717A.
12. Guane R. Prevalence of HBV and risk of HBV acquisition in hepatitis B screening programs in large metropolitan cities in the United States. *Hepatology*. 2004;40(Suppl 1):716A.
13. Chao SD. High prevalence of chronic hepatitis B (HBV) infection in adult Chinese Americans living in California. *Hepatology*. 2004;40(Suppl 1):717A.
14. McQuillan GM, Coleman PJ, Kruszon-Moran D, et al. Prevalence of hepatitis B virus infection in the United States: the National Health and Nutrition Examination Surveys, 1976 through 1994. *Am J Public Health*. 1999;89(1):14–18.
15. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *J Viral Hepat*. 2004;11(2):97–107.
16. McBride G. Hepatitis B virus-induced liver cancer in Asian Americans: a preventable disease. *J Natl Cancer Inst*. 2008;100(8):528–529.
17. Clegg LX, Li FP, Hankey BF, et al. Cancer survival among US whites and minorities: a SEER (Surveillance, Epidemiology, and End Results) Program population-based study. *Arch Intern Med*. 2002;162(17):1985–1993.
18. Nguyen EV. Cancer in Asian American males: epidemiology, causes, prevention, and early detection. *Asian Am Pac Isl J Health*. 2003;10(2):86–99.
19. Fleming DT, Zambrowski A, Fong F, et al. Surveillance programs for chronic viral hepatitis in three health departments. *Public Health Rep*. 2006;121(1):23–35.
20. Nguyen TT, Taylor V, Chen MS Jr, et al. Hepatitis B awareness, knowledge, and screening among Asian Americans. *J Cancer Educ*. 2007;22(4):266–272.
21. Younossi ZM, Stepanova M, Afendy M, et al. Changes in the prevalence of the most common causes of chronic liver diseases in the United States from 1988 to 2008. *Clin Gastroenterol Hepatol*. 2011;9(6):524–530.
22. Guane RSP, Lam K, Kim KE, et al. Prevalence of HBV and risk of HBV acquisition in hepatitis B screening programs in large metropolitan cities in the US. *Hepatology*. 2004;40(S):716A.
23. Tong MJ, Hwang SJ. Hepatitis B virus infection in Asian Americans. *Gastroenterol Clin North Am*. 1994;23(3):523–536.
24. Yeh FS, Yu MC, Mo CC, et al. Hepatitis B virus, aflatoxins, and hepatocellular carcinoma in southern Guangxi, China. *Cancer Res*. 1989;49(9):2506–2509.
25. Kew MC, Yu MC, Kedda MA, et al. The relative roles of hepatitis B and C viruses in the etiology of hepatocellular carcinoma in southern African blacks. *Gastroenterology*. 1997;112(1):184–187.
26. Lok AS, McMahon BJ. Chronic hepatitis B. *Hepatology*. 2007;45(2): 507–539.
27. Beasley R. Hepatitis B virus as the etiologic agent in hepatocellular carcinoma. *Hepatology*. 1982;2(S):21–26.
28. Chang ET, et al. 3 For Life: a model pilot program to prevent hepatitis B virus infection and liver cancer in Asian and Pacific Islander Americans. *Am J Health Promot*. 2009;23(3):176–181.
29. Kallman JB, Tran S, Arsalla A, et al. Vietnamese community screening for hepatitis B virus and hepatitis C virus. *J Viral Hepat*. 2011;18(1):70–76.
30. CDC. Screening for chronic hepatitis B among Asian/Pacific Islander populations—New York City, 2005. *MMWR Morb Mortal Wkly Report*. 2006;55(18):505–509.
31. Hwang JP, Mohseni M, Gor BJ, et al. Hepatitis B and hepatitis C prevalence and treatment referral among Asian Americans undergoing community-based hepatitis screening. *Am J Public Health*. 2010;100(Suppl 1):S118–S124.
32. Hsu CE, Zhang G, Yan FA, et al. What made a successful hepatitis B program for reducing liver cancer disparities: an examination of baseline characteristics and educational intervention, infection status, and missing responses of at-risk Asian Americans. *J Community Health*. 2010;35(3):325–335.
33. Hsu CE, Liu LC, Juon HS, et al. Reducing liver cancer disparities: a community-based hepatitis-B prevention program for Asian-American communities. *J Natl Med Assoc*. 2007;99(8):900–907.
34. Lee J, Lok AS, Chen J. Hepatitis B prevalence among Asian Americans in Michigan: an assessment to guide future education and intervention strategies. *J Community Health*. 2010;35(5):534–542.
35. Tsai NC, Holck PS, Wong LL, et al. Seroepidemiology of hepatitis B virus infection: analysis of mass screening in Hawaii. *Hepatol Int*. 2008;2(4):478–485.
36. Hu KQ, Pan CQ, Goodwin D. Barriers to screening for hepatitis B virus infection in Asian Americans. *Dig Dis Sci*. 2011;56(11):3163–3171.