



Prevalence of Viral Hepatitis in Foreign-Born Populations in the Baltimore-Washington Metropolitan Area, 2009–2015

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Abstract

While the majority of viral hepatitis is experienced in the developing world, migration of people from high prevalence countries contributes to health outcomes in the United States. The purpose of this study was to estimate the prevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV) infection in foreign-born immigrants living in the Baltimore-Washington metropolitan area. This study used cross-sectional data from 5982 individuals screened at community events held from 2009 to 2015. Descriptive statistics were generated to describe the screening results. Positive results for HBV infection (HBsAg+) and HCV infection (HCVAb+) were analyzed according to age, gender, and country of birth. Of 5982, the majority of participants were born in Asia (77.8%). The prevalence of infection was 6.1% for HBV and 3.8% for HCV in Asia-born immigrants compared to 3.7% for HBV and 2.8% for HCV in Africa-born immigrants. Among participants who were Asia-born, prevalence of HBV infection was highest for those from Cambodia (11.9%) compared to Vietnam (8.2%), China (8.1%), Laos (6.1%), and Korea (4.6%). Among participants who were Africa-born, prevalence of HBV was highest for those from Liberia (6.7%) and Sierra Leone (6.7%), followed by Cameroon (4.4%) and Nigeria (4.2%). The highest HCV prevalence occurred among those from Cambodia (10.8%) and Myanmar (4.9%) in Asia and those from Cameroon (11.4%) and Nigeria (4.8%) in Africa. This study suggests that screening data are disaggregated by country of birth, then improvements can be made to programs for prevention, earlier diagnosis, and linkage to care.

Keywords Hepatitis prevalence · Country of birth · Asian immigrants · African immigrants

Introduction

Hepatocellular carcinoma (HCC) ranks second in cancer mortality worldwide [1]. HCC especially impacts less developed regions where 83% of the estimated 782,000 new cases of HCC worldwide occurred in 2012 [1]. Most cases of primary liver cancer (estimated 78%) are caused by chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infection [2]. Worldwide prevalence of chronic HBV infection is

estimated at 257 million and of HCV infection is estimated at 130–170 million [2].

The majority of viral hepatitis is experienced in the developing world. Individuals living in the United States who have HBV or HCV have an increased likelihood of having migrated from a high prevalence region. Of the foreign-born U.S. residents with chronic HBV infection, the majority (58%) were born in Asia, and 11% were born in sub-Saharan Africa [3]. This also includes, in particular, Central and East Asia and North Africa, regions which are estimated to have high prevalence of HCV (> 3.5%), and South and Southeast Asia and sub-Saharan Africa, regions which have moderate prevalence of HCV (1.5–3.5%) [4].

Current epidemiological information for HBV and HCV infection in U.S. immigrants is limited and there is inadequate data about infection prevalence among immigrant populations who are from endemic areas. Moreover, little is known about the disaggregated distribution of HBV and HCV infection among subpopulations of Asian- and African-born immigrants. Current guidelines recommend HBV

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screening for persons with high risk for infection, but routine testing has not been initiated. Because HBV infection is preventable by vaccination, disaggregation of HBV infection demographic data is beneficial for targeted prevention against liver cancer. Because HCV can now be cured with a recently approved drug, education and early detection is important to reduce HCV transmission and complications.

To fill the information gaps, this report uses community-based screening data to estimate the prevalence of HBV and HCV infection within Asian- and African-born immigrants in the Baltimore-Washington Metropolitan area. In particular, we aimed to determine the prevalence for specific subpopulations in order to better estimate of the burden of viral hepatitis in the United States. Knowing this information can help guide HCC prevention and targeted screenings efforts for HBV and HCV.

Methods

Data Collection

The Hepatitis B Initiative of Washington, DC (HBI-DC), is a community-based organization founded in 1996 to prevent liver diseases caused by viral hepatitis in high-risk immigrant groups. Through collaborative partnerships, HBI-DC provides education, free viral hepatitis screenings, hepatitis B vaccination, and patient navigation services for impacted communities. From November 2009 to December 2015, HBI-DC organized free screening events at churches, temples, health fairs, and community centers in the Baltimore-Washington metropolitan area (Maryland, northern Virginia, and Washington, D.C.).

By following community-based participatory research principles, HBI-DC worked with community leaders to develop recruitment strategies. Linguistically- and culturally-tailored flyers were designed to announce the events and were posted in prominent locations in the community. The events were also publicized by local ethnic radio stations and newspapers.

On the day of the events, screening staff included community partner representatives, bilingual volunteers, and trained phlebotomists. Health educators were also present to provide further information about chronic hepatitis infection and the importance of hepatitis B vaccinations based on screening results. Event participants ages 18 and over were consented and given a brief intake form about their demographic information, which included questions about country of birth, age, and sex. They were asked in either English or in their native languages (e.g., Chinese, Korean, Vietnamese). Free on-site HBV and HCV testing was then administered by the phlebotomists. Participants were contacted within 2–3 weeks

with their results. This study was approved by The George Washington University's Institutional Review Board.

Measures

Serology results included status of hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (anti-HBs), and hepatitis C antibody (anti-HCV). For HBV screening, participant results were divided into one of three groups as follows: (a) HBV infected (positive HBsAg); (b) susceptible to HBV infection (negative HBsAg and negative anti-HBs); or (c) immune to HBV infection (negative HBsAg and positive anti-HBs). Participants who were positive for anti-HCV also had results for reflex HCV RNA quantitative testing through reverse transcription polymerase chain reaction assay (RT-PCR). The sensitivity threshold for HCV RNA was 15 IU/mL.

Analysis

Descriptive statistics were generated to describe the screening results. Positive results for HBV infection (HBsAg+) and HCV infection (HCVAb+) were analyzed according to age, gender, and country of birth. The prevalence of sample subpopulations was further calculated for birth countries represented by at least 30 participants. All statistical analysis was performed with Stata, version 14 (StataCorp LLC).

Results

A total of 5982 adults older than 18 years participated in the screenings. A majority of participants were born in Asia (77.8%), Africa (11.4%), and North America (7.8%). Of those Asian-born, the majority were from Vietnam (24%), China (22.8%), Myanmar/Burma (22.5%), and Korea (16.9%). Of those African-born, the majority were from Ethiopia (31.6%), Nigeria (13.9%), Cameroon (9.9%), and Ghana (8.9%). About 5% of participants were from Sierra Leone, Liberia, and Togo. Of the participants who were born in North America, about two-thirds (62.7%) were U.S.-born, followed by El Salvador (16.3%) and Mexico (9.2%) (Table 1).

A total of 5762 individuals underwent HBV screening and 5.3% of them were found to be infected with HBV. Prevalence of HBV was higher in those born in Asia (6.1%) and in those born in Africa (3.7%) compared to those born in the United States (<1%) (Table 2).

Individuals who were born in the United States had the highest rate of unprotected from HBV (58.1%) and the lowest rate of protected from HBV (40.9%), compared to those foreign-born immigrants ($p < .001$) (Table 2). Males were statistically more likely to be infected with HBV than

Table 1 Region of origin for participants of community-based hepatitis screenings in the Baltimore-Washington Metropolitan area, 2009–2015 (n = 5982)

Region	Countries with > 30 participants	Total participants	
		N	%
Asia	China, Vietnam, Korea, Myanmar (Burma), India, Philippines, Thailand, Taiwan, Pakistan, Cambodia, Laos	4656	77.8
Africa	Ethiopia, Nigeria, Ghana, Cameroon, Liberia, Sierra Leone, Togo	684	11.4
North America	US, Mexico, El Salvador	466	7.8
South America	Not applicable	59	1.0
Europe	Not applicable	16	0.3
Unknown		101	1.7
Total		5982	100

Table 2 Prevalence of Hepatitis B and C infection in the Baltimore-Washington Metropolitan area, 2009–2015, divided by birth region

	Total screened	US (n=302)	Asia (n=4656)	Africa (n=684)	p Value
HBV infection status	N = 5762	N = 298	N = 4446	N = 684	.000
Infected	303 (5.2%)	3 (1.0%)	269 (6.1%)	25 (3.7%)	
Protected	3144 (54.6%)	122 (40.9%)	2590 (58.2%)	342 (50.0%)	
Unprotected	2315 (40.2%)	173 (58.1%)	1587 (35.7%)	317 (46.3%)	
HCV infection status	N = 3351	N = 163	N = 2590	N = 425	.597
HCV antibody positive	116 (3.5%)	5 (3.1%)	97 (3.8%)	12 (2.8%)	

Table 3 Demographic characteristics and screening results of participants from community-based hepatitis screenings in the Baltimore-Washington Metropolitan area, 2009–2015

	Total participants (n = 5982)	Hepatitis B infected (n = 303)		Hepatitis C exposed (n = 116)	
		N (%)	p Value	N (%)	p Value
Gender (n = 5589)			.000		.055
Males	2327 (41.6)	147 (6.3)		56 (4.0)	
Females	3262 (58.4)	138 (4.2)		50 (2.8)	
Age, years			.004		.007
<30	647 (10.8)	20 (3.1)		5 (1.3)	
30–39	937 (15.7)	56 (6.0)		16 (2.6)	
40–49	1237 (20.7)	80 (6.5)		21 (3.0)	
50–59	1440 (24.1)	79 (5.5)		32 (4.1)	
60–69	1119 (18.7)	45 (4.0)		24 (4.0)	
70+	602 (10.1)	23 (3.8)		18 (6.5)	

females (6.3% vs. 4.2%; $p < .001$), and participants in their 40 s had highest prevalence of HBV infection (6.5%) followed by those in their 30 s (6.0%) and in their 50 s (5.5%; $p < .004$) (Table 3).

A total of 3351 underwent HCV screening and 3.5% of them were found to be sero-positive for HCV antibody. Prevalence of HCV was higher among those born in Asia (3.8%), followed by those born in the United States (3.2%) and Africa (2.8%). The prevalence of HCV infection was

particularly higher among those older than 70 years old (6.5%) compared to the other age groups (range 1.3–4.1%, $p < .007$) (Table 3).

The prevalence of HBV or HCV infection also varied by country of origin (Table 4). Among Asia-born participants, prevalence of hepatitis infection was significantly higher for Cambodians (11.9% HBV; 10.8% HCV) than other individuals born in Asia. For other Asia-born participants, the prevalence of HBV infection and HCV infection was as follows: Vietnamese (8.2%; 4.4%), Chinese (8.1%; 0.4%), Laotian (6.1%; 3.0%), and Koreans (4.6%; 1.0%). There was also a high prevalence of HCV infection among Burmese (4.9%) and Asian Indian (4.1%) participants. Among Africa-born participants, the highest HBV prevalence occurred among those from Liberia (6.7%) and Sierra Leone (6.7%), followed by Cameroon (4.4%) and Nigeria (4.2%); and the highest HCV prevalence occurred among those from Cameroon (11.4%), followed by Nigeria (4.8%).

Discussion

Our findings estimate the chronic HBV and HCV prevalence in immigrants of the Baltimore-Washington Metropolitan area. Our findings on HBV and HCV prevalence differed from other studies with community screening data. These differences between our study's and other studies' findings may be due to the varied ethnicities within sample

Table 4 Proportion of viral hepatitis infection among foreign-born persons from Asia and Africa by country of birth, determined from community-based hepatitis screenings in the Baltimore-Washington Metropolitan area, 2009–2015

Country of birth	HBV infection		HCV infection	
	Total No. tested	HBsAg positive No. (%; 95% CI)	Total No. tested	HCV antibody positive No. (%; 95% CI)
Asia				
China	1061	86 (8.1%, 6.6–9.9)	238	1 (0.4%, 0.1–3.0)
Vietnam	1115	91 (8.2%, 6.7–9.9)	791	35 (4.4%, 3.2–6.1)
Myanmar (Burma)	1046	36 (3.4%, 2.5–4.7)	927	45 (4.9%, 3.6–6.4)
Korea	783	36 (4.6%, 3.3–6.3)	198	2 (1.0%, 0.2–4.0)
India	151	0	121	5 (4.1%, 1.7–9.7)
Thailand	90	3 (3.3%, 1.1–10.0)	89	0
Pakistan	73	1 (1.4%, 0.2–9.5)	67	2 (3.0%, 0.7–11.5)
Philippines	58	1 (1.7%, 0.2–11.9)	N/A	
Cambodia	42	5 (11.9%, 4.9–26.4)	37	4 (10.8%, 3.9–26.5)
Laos	33	2 (6.1%, 1.4–22.6)	33	1 (3.0%, 0.4–20.3)
Africa				
Ethiopia	216	6 (2.8%, 1.2–6.1)	194	2 (1.0%, 0.3–4.1)
Nigeria	95	4 (4.2%, 1.6–10.9)	21	1 (4.8%, 0.6–30.9)
Cameroon	68	3 (4.4%, 1.4–13.1)	35	4 (11.4%, 4.1–27.8)
Ghana	61	0	8	0
Sierra Leone	30	2 (6.7%, 1.5–24.7)	18	0
Liberia	30	2 (6.7%, 1.5–24.7)	19	0
Togo	30	1 (3.3%, 0.4–22.2)	17	0

population, socioeconomic differences between populations of different U.S. cities, and screening recruitment method.

For HBV, our finding of 6.1% prevalence among Asian Americans was similar to studies in Los Angeles, California (5.3%), but lower compared to studies in New York City (13%) and Houston, Texas (13.6%) [5–7]. Our finding of 3.7% HBV prevalence among African immigrants was lower than studies in New York City (9.3%) and Chicago, Illinois (8%) [8, 9]. When we disaggregated our data by country of birth, the prevalence of HBV infection was highest among immigrants from Cambodia, Vietnam, and China, similar to other studies that also showed prevalence for individuals from these countries [3]. Of the African countries, Sierra Leone and Liberia had the highest HBV prevalence (6.7% each), which is lower than that of a prior meta-analysis (16.5% from Liberia; 11.9% from Sierra Leone) [3].

For HCV, our finding of 3.8% prevalence in Asian immigrants was lower than the 6.0% prevalence in Asian Americans studied in Houston, Texas [6]. We were unable to find any studies examining HCV prevalence in African immigrants. Our findings also revealed that individuals older than 70 years old had a much higher HCV infection prevalence than the other age groups, which may be due to the lack of universal screening for HCV in blood donors before 1992. The majority of HCV infections in the United States are a result of infected blood transfusions before 1992, which likely accounts for the higher rates of chronic HCV infection among older populations in the US [10]. Further research

is required to compare HCV-infected African immigrants living in different U.S. regions.

Our study had some limitations. In order to collect a sample of foreign-born immigrants, our data set was based on non-probability sampling methods through community screenings. As a result, our findings may not be representative of the entire population of foreign-born Asian and African Americans of the Baltimore-Washington metropolitan area. However, this sampling method allowed for a large recruitment of participants from a hard-to-reach immigrant population. Our strategies may have also resulted in an underestimation of HBV and HCV infection prevalence. Individuals who already knew that they were infected might have been less likely to participate in community screenings. Our findings may represent a conservative estimate of HBV and HCV prevalence due to this selection bias.

Our findings imply that immigrants from Asia and Africa uniquely differ in HBV and HCV infection prevalence than the general population. The prevalence of viral hepatitis infection also differs for populations depending on their country of birth. This suggests that more culturally-integrated intervention programs are needed to reduce the complications caused by chronic HBV or HCV infection among high-risk immigrant communities.

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Compliance with Ethical Standards

Conflict of interest None of the authors have any conflict of interest to report.

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