

HBV Outreach Programs Significantly Increase Knowledge and Vaccination Rates Among Asian Pacific Islanders

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Abstract Hepatitis B virus (HBV) testing and vaccination rates remain low among Asian-American/Pacific Islanders (APIs) despite high rates of HBV infection. The aim of our study was to assess the effectiveness of an outreach campaign to increase HBV knowledge, testing, and vaccination among a cohort of APIs. Vietnamese Americans were invited to participate in a free HBV screening and vaccination outreach program through public service announcements. Attendees completed a survey to assess barriers to vaccination and HBV-related knowledge before and after a 30-min education session by a bilingual board-certified gastroenterologist. Among 98 participants, 100 % (22/22) of HBV naïve patients were provided a HBV vaccination series at no cost and over 75 % (14/18) of HBV-infected patients were connected to further medical care. Notable reported barriers to prior testing and/or vaccination were cost of the vaccine, concern about missing work for evaluation, and lack of provider recommendation. Knowledge levels about HBV risk factors, potential consequences, and treatment options were poor at baseline but significantly increased after the education session (49 vs. 64 %, $p < 0.001$). Outreach campaigns linked with education can successfully address several barriers to HBV testing and offer an approach to improve HBV awareness and prevention among difficult-to-reach populations.

Keywords Hepatitis B · Outreach · Vaccination · Prevention · Education

Introduction

Chronic hepatitis B virus (HBV) infection is a global health issue, with approximately 350 million affected worldwide and an estimated 620,000 dying annually from HBV-related disease [1, 2]. In the United States alone, approximately 1.2–2.2 million people are affected, of whom 50 % are Asian-American/Pacific Islander (API) [2]. This number is sobering when taking into account that APIs comprise only 4 % of the US population; HBV affects nearly 1 in 10 APIs [1–3]. Given the overall prevalence of <0.2 % among White non-Hispanics, HBV infection is one of the largest racial and ethnic health disparities in the United States [2]. The gap in HBV prevalence between ethnic groups is likely to widen as the United States continues to attract immigrants, with APIs comprising the largest group of immigrants.

Despite these high prevalence rates, HBV knowledge among APIs is low, likely contributing to a low probability of being tested and/or vaccinated [3–6]. In fact, nearly two-thirds of HBV-infected APIs are unaware of their disease and many uninfected APIs fail to undergo HBV vaccination [5, 6]. Additionally, <10 % of treatment-eligible patients receive HBV therapy [7]. The Institute of Medicine 2010 report indicates that a primary reason for the failure to arrest the progression and spread of HBV is the lack of education and awareness [8]. HBV knowledge is important to assess in different API communities across the country, as education campaigns may increase knowledge and improve downstream outcomes, including increasing HBV testing, vaccination, and clinical management as indicated.

On behalf of the Dallas Fort Worth Hepatitis B Free Project.

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Campaigns against HBV in major US metropolitan areas with large API populations, such as New York, Philadelphia, and San Francisco have aimed to increase HBV awareness and testing [9, 10]. With over 950,000 Asian residents, Texas is home to the 3rd largest Asian population in the US [11]. Over 35 % of APIs live in Dallas–Fort Worth (DFW), making the DFW area an appropriate site for further HBV outreach efforts [11]. To address the needs of this at-risk population, the DFW Hepatitis B Free Project, a medical student-run community outreach initiative, was started with the goal of providing HBV-related education and access to free HBV testing and vaccination. The aims of our study were to: (1) characterize HBV knowledge and barriers to vaccination, (2) assess the ability of an educational session to increase HBV knowledge, and (3) determine the ability of an outreach program to increase vaccination rates among a large group of APIs.

Methods

Study Population

The DFW Hepatitis B Free Project was initially founded in 2010 as a collaboration between the Asian Pacific American Medical Student Associations (APAMSAs) at UT Southwestern Medical Center (UTSW) in Dallas and Texas College of Osteopathic Medicine (TCOM) in Fort Worth. The goal of this community outreach program is to increase HBV awareness and knowledge through culturally appropriate education sessions as well as to provide HBV testing, vaccination, and linkage to medical care as needed. Now in its fourth year of existence, the DFW Hepatitis B Free has provided these services to more than 1,000 API individuals (primarily Vietnamese and Chinese Americans) in the area.

In April 2010, Vietnamese Americans from the DFW metropolitan area were invited to participate in one such HBV education and screening program through public service announcements using a Vietnamese radio station, Vietnamese newspaper, and fliers distributed in the area. Medical students coordinated the session, and trained phlebotomists collected blood samples for HBsAg and anti-HBs on all attendees. Serum samples were coded, frozen and subsequently used to test for active infection (positive for HBsAg), HBV immunity (positive for anti-HBs), or no evidence of infection (negative for both HBsAg and anti-HBs). Patients with known HBV status, either active infection and/or prior vaccination, were excluded and not subjected to repeat testing. The study was approved by the Institutional Review Board at UT Southwestern Medical Center.

Survey Development and Administration

All attendees were asked to complete a self-administered survey at initial registration. The survey was provided in

Vietnamese or English, depending on the individual's preferred language. The survey assessed baseline HBV-related knowledge, attitudes about HBV infection and testing, barriers to prior testing or vaccination, and demographic data. The knowledge section assessed participant understanding of HBV risk factors, potential symptoms and consequences of chronic HBV infection, and treatment availability. Potential reported barriers included difficulty accessing all medical care, potential for missing work, cost of the vaccine, and stigma of HBV infection. Demographic information of interest included age, gender, country of origin, marital status, health insurance status, education level, employment status, income level, and number of years in the United States. Questions were adapted from earlier validated surveys when available. After initial development, the survey was pretested among a group of medical students and Gastroenterology faculty at UT Southwestern Medical Center.

Education Program

After HBV testing was completed on all attendees, a bilingual board-certified gastroenterologist (S.D) provided a 30-min education session focusing on HBV risk factors, consequences, and efficacy of treatment. The education session was done in English and Vietnamese and was presented in lay language to be easily understood by non-medical persons. After the presented material, there was an open question and answer session with all attendees. One month after the education session, participants were asked to complete a survey, with the same questions from the baseline survey, to assess for persistent changes in HBV knowledge.

Vaccination and Treatment Outreach Programs

All participants were invited back to receive HBV testing results 1 month after the initial outreach program. Medical and undergraduate students coordinated the follow-up session, but board-certified gastroenterologists were available to answer any patient questions. Participants were categorized into one of three groups: presumed chronic HBV infection (HBsAg positive and anti-HBs negative), HBV immune (HBsAg negative and anti-HBs positive), and HBV naïve (HBsAg negative and anti-HBs negative). HBV immune patients were informed that no further evaluation and/or treatment were necessary, and HBV-naïve patients were offered the three-shot HBV vaccination series free of cost. Patients with presumed chronic HBV infection were provided with appropriate linkage to medical care through referral to local healthcare providers and/or safety net hospital systems for further evaluation, including HBV serologies and viral load, and treatment as

needed. Patients with insurance were encouraged to see primary care providers and/or hepatologists within their insurance network. Patients without insurance were assisted to obtain help through a safety-net health network as available (e.g. Parkland Health and Hospital System in Dallas). Patients who were unable to be contacted after three attempts were labeled as lost to follow-up.

Statistical Analysis

Distributions of demographics and survey results were reported with descriptive characteristics. A summary knowledge score was determined, with one point given for each correct answer and zero points for incorrect or uncertain answers. Although missing values were excluded for demographics, they were grouped with incorrect answers for knowledge questions as it implied uncertainty regarding the question. To identify factors associated with knowledge, univariate analysis was performed using Fisher exact and Mann–Whitney rank-sum tests, and multivariate analysis was performed using multivariate linear regression analysis. Statistical significance was defined as a p value <0.05 . All data analysis was performed using Stata 11.0 (StataCorp, College Station, TX).

Results

Patient Characteristics

Ninety-eight people attended the HBV screening outreach program. The characteristics of the patients who attended the program and underwent HBV testing are provided in Table 1. The median age was 57 years, and 54 % were female. A majority of people (91 %) was born in Vietnam, with 98 % reporting fluency in Vietnamese and 64 % fluency in English. The median number of years in the United States was 16, ranging from <1 year up to 38 years. Approximately one-third of people had a college education, with an equal proportion having less than a high school education. Most attendees reported actively working, although less than half reported an annual income exceeding \$20,000.

HBV Knowledge at Baseline

Of the 98 eligible persons, we achieved a baseline survey response of 100 %. Although over two-thirds correctly identified needles, tattoos, and/or childbirth as potential etiologies for HBV infection, only half of respondents knew sexual contact could be a risk factor. Furthermore, approximately one-fifth incorrectly believed smoking tobacco and/or sharing food are potential HBV risk factors. In terms of potential consequences, over two-thirds knew HBV could lead to death and HCC; however, only one-

Table 1 Demographics of cohort

| Variable | All persons (n = 98) |
|---|----------------------|
| Age (years) ^a | 57 (18–85) |
| Gender (% female) | 53 (54.1 %) |
| Marital status (% married) | 60 (61.2 %) |
| Country of birth | |
| Vietnam | 89 (90.8 %) |
| China | 6 (6.1 %) |
| Other | 3 (3.1 %) |
| Years in the United States (years) ^a | 16 (0–38) |
| Language | |
| Fluent in Vietnamese | 96 (98.0 %) |
| Fluent in English | 63 (64.3 %) |
| Education | |
| Less than high school | 37 (37.8 %) |
| High school graduate | 26 (26.5 %) |
| College education | 34 (34.7 %) |
| Employment | |
| Actively employed | 59 (60.2 %) |
| Retired | 14 (14.3 %) |
| Unemployed | 9 (9.2 %) |
| Income/year | |
| Less than \$10,000 | 25 (25.5 %) |
| \$10,000–\$20,000 | 29 (29.6 %) |
| \$20,000–\$30,000 | 21 (21.4 %) |
| \$30,000–\$40,000 | 13 (13.3 %) |
| Greater than \$40,000 | 10 (10.2 %) |
| Health Insurance coverage | 31 (31.6 %) |

^a Expressed as median (range)

third of persons knew it could lead to chronic infection. Only half of respondents were aware that treatment for HBV existed and offered potential for cure. The only predictor of baseline knowledge on univariate analysis was a perceived high risk of contracting HBV ($p = 0.04$).

Change in HBV Knowledge After Education

We achieved a survey response of 81.6 % for the follow-up survey 1 month later. Baseline and post-education levels of knowledge for the 80 patients who completed both surveys are detailed in Table 2. After the education session, respondents had a significant increase in knowledge about risk factors ($p = 0.002$), potential consequences ($p = 0.003$), and the potential for treatment ($p = 0.009$). There was a notable increase in the proportion who correctly identified risk factors including sharing a toothbrush (59 vs. 70 %), sexual contact (49 vs. 64 %), and childbirth (68 vs. 81 %). Similarly, there was an increase in knowledge about potential consequences including chronic infection (28 vs. 49 %), hepatocellular carcinoma (71 vs. 80 %), and death (69 vs. 85 %). Finally,

Table 2 Patient knowledge before and after HBV education session

| Variable | Pre-education | Post-education | <i>P</i> value |
|-------------------------------|---------------|----------------|----------------|
| Risk factors (% yes) | | | |
| Smoking tobacco | 12 (15.0 %) | 23 (28.8 %) | 0.002 |
| Sharing food | 15 (18.8 %) | 36 (45.0 %) | |
| Sneezing/coughing | 23 (28.8 %) | 43 (54.4 %) | |
| Sharing toothbrush | 47 (58.8 %) | 56 (70.0 %) | |
| Sexual contact | 39 (48.8 %) | 51 (63.8 %) | |
| Needles, tattoos | 59 (73.8 %) | 68 (85.0 %) | |
| Childbirth | 54 (67.5 %) | 65 (81.3 %) | |
| Potential consequences | | | |
| Lifelong infection | 22 (27.5 %) | 39 (48.8 %) | 0.003 |
| Hepatocellular carcinoma | 57 (71.3 %) | 64 (80.0 %) | |
| Death | 55 (68.8 %) | 68 (85.0 %) | |
| HBV can be treated | 42 (52.5 %) | 58 (72.5 %) | 0.009 |
| Total knowledge (%) | 48.9 ± 25.6 | 64.3 ± 26.5 | <0.001 |

there was a significant increase in the proportion of persons who knew that HBV was potentially treatable (53 vs. 73 %).

The median change in knowledge between baseline and follow-up surveys was an increase of 16.7 %, although there was a large range from a decrease of 66.7 % to an increase of 91.7 %. Predictors of change in knowledge on univariate analysis included baseline levels of knowledge ($p < 0.001$), gender ($p = 0.02$), and marital status ($p = 0.04$). On multivariate analysis, baseline knowledge was the only significant predictor, with larger increases in knowledge among those with poor baseline knowledge ($p < 0.001$). Patients with baseline knowledge scores of 50 % or below had a 28 % mean increase in knowledge compared to only a 5 % mean increase in knowledge among those with higher baseline knowledge.

Barriers to Prior Testing and Vaccination

The most common barrier to prior HBV testing and/or vaccination was cost of testing and vaccination, being reported by 65 % ($n = 65$) of respondents. Over 50 % ($n = 56$) indicated missing work to attend a doctor appointment was also a notable barrier. Only 44 % ($n = 43$) of people believed they were likely to get HBV infection, and nearly half were falsely reassured by the belief that HBV-infected patients are ill appearing and symptomatic. Lack of provider recommendation may also contribute to underuse of testing, as only one-third ($n = 32$) of persons reported a prior provider recommendation for HBV testing. In contrast, only 32 % ($n = 31$) thought the stigma of HBV infection was a barrier to HBV testing. Similarly, concerns about HBV vaccines being ineffective (2 %) or unsafe (3 %) were not significant reported barriers to HBV testing.

Linkage to Care

HBV status of the participants was as follows: 59.2 % ($n = 58$) were HBV immune, 22.4 % ($n = 22$) were HBV naïve, and 18.4 % ($n = 18$) had presumed chronic HBV infection. We informed all HBV immune patients they had either been previously vaccinated or cleared prior infection and that they did not need further evaluation or treatment through our program. Over the following year, we successfully completed the three-shot vaccination series in 100 % of HBV naïve patients. Most patients received the vaccines over a six-month period, although some participants took up to 1 year to complete the full series. Over 75 % (14/18) of patients with active infection were successfully navigated to appropriate medical care, including nine patients without medical insurance. The four patients who we were unable to connect to medical care lived in areas without a safety net institution or were unable to be contacted due to a change in their contact information.

Discussion

Our study explored HBV-related knowledge, attitudes and barriers among a cohort of mostly foreign-born Vietnamese Americans. We found that this group of APIs demonstrated misconceptions and suboptimal levels of knowledge regarding HBV risk factors, potential consequences, and treatment options. Our outreach program, including a 30-min education program and rigorous follow-up, was able to successfully provide HBV testing and vaccination to participants as well as significantly increase sustained knowledge levels across all three domains.

Our study supports conclusions of the 2010 Institute of Medicine report that one of the primary reasons for the continued spread of HBV may be lack of education and awareness [8]. Consistent with prior studies in other API populations, baseline levels of knowledge regarding HBV in our study were low [4–6]. Although many respondents knew about vertical routes of transmission (i.e., childbirth), only approximately half of the cohort identified horizontal routes of transmission, including sexual transmission and/or sharing toothbrushes. Furthermore, nearly half of respondents were unaware of potential treatment options. Deficiencies in HBV knowledge among APIs may be attributed to several factors including language barriers, ineffective health communication, and/or alienation from the health system [4]. Several of these barriers may be particularly prevalent among patients in our cohort, which had a high rate of low socioeconomic status, low education, and uninsured persons.

Our study highlights a simple education campaign can significantly increase knowledge regarding three important domains related to HBV, including risk factors, potential consequences and treatment. Education can correct important knowledge deficiencies, such as the lack of awareness about potential treatment options [12]. Similarly, education is important to erase the false sense of security from believing that HBV-infected patients always appear ill. Several studies have found HBV-related knowledge is correlated with rates of HBV vaccination and treatment [10, 13]. Education can promote increased patient involvement in medical care, which often leads to increased uptake of testing and treatment [14]. Furthermore, education programs allow diffusion of these concepts beyond the direct participants to others in the community. In fact, approximately half of the persons in our cohort had reported discussing HBV with their family and/or friends (data not shown).

Outside of suboptimal rates of knowledge regarding HBV, our study also identified cost of the vaccination and missing work as two potential barriers to accessing further care. These barriers may be particularly prevalent among low education and low socioeconomic status API populations. Outreach programs, with low-cost or free testing and vaccines, are able to overcome both of these barriers, particularly if provided during evening or weekends.

Our study also highlights the potential for outreach campaigns to increase rates of HBV vaccination and evaluation/treatment. Campaigns in San Francisco, New York and Philadelphia have been able to demonstrate the success of providing outreach programs with low-cost or free HBV testing and vaccination [9, 10, 15]. We were able to provide free vaccination series to 100 % of HBV naïve patients, and we successfully connected over 75 % of HBsAg positive persons to medical care. Of note, our program was successful at providing care to traditionally

difficult-to-reach persons, i.e., a cohort with high rates of low socioeconomic status, low education, and uninsured persons. We believe part of the success of our program can be attributed to its culturally appropriate design. Initial recruitment was done through Vietnamese radio and newspaper education sessions, and the education session was provided in lay language by a bilingual gastroenterologist.

It is important to note that our study had limitations. First, our study targeted Vietnamese Americans, who have different educational and socioeconomic backgrounds than other API populations. Furthermore, our study was limited by non-random sampling, with our cohort consisting of persons who responded to our initial outreach invitation. Therefore, results from our survey, including levels of knowledge and reported barriers, might not be representative of other API populations. Second, survey studies are inherently limited by response bias, in which respondents may answer questions how they “should respond” instead of reflecting actual attitudes and barriers. Finally, we were able to demonstrate our outreach program successfully connected HBV-infected persons to medical care, but this is only the first step in a long process. Studies in other liver diseases have demonstrated patients who seek medical attention may still not receive appropriate care due to provider-level or system-level barriers [16–18]. Similarly, HBV-infected patients may not receive appropriate evaluation and/or treatment even after being navigated to medical care [10].

Overall, our study underscores the importance of designing culturally appropriate health interventions to improve screening, vaccination, and treatment for HBV among APIs. Our outreach program successfully addressed several barriers to testing and vaccination among a difficult-to-reach population. We were able to vaccinate participants and/or navigate them to medical care as needed as well as significantly increase HBV-related knowledge among participants. Programs, such as DFW Hepatitis B Free Initiative, are a sustainable approach to improve HBV awareness and testing among APIs and offer an avenue to halt the continued spread of HBV infection in these populations.

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Conflict of interest None of the authors have any personal interests relevant to this manuscript to declare

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