

# Hepatitis B Screening and Awareness in the Milwaukee Hmong Community

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## ABSTRACT

**Introduction:** Hepatitis B virus (HBV) infection disproportionately affects the Hmong ethnic group, with reported US prevalence rates up to 20%, but data for Wisconsin's large Hmong community is lacking. We assessed the prevalence of HBV at Hmong screening events and whether small-group counseling affects HBV knowledge.

**Methods:** Free HBV screening events were held in Milwaukee, Wisconsin at a Hmong market, a local church, and annual Hmong New Year festival. Eligible Hmong subjects age 18 years and older also were invited to complete a 15-point survey on HBV knowledge at baseline and after education sessions. Hmong interpreters were available, and free HBV screening was offered.

**Results:** A total of 187 participants were tested for HBV, and 161 completed surveys. After education sessions, the mean knowledge score rose to 10.6 (71%) vs the pre-education score of 6.7 (45%) ( $P < 0.0001$ ). Active HBV [HBsAg(+) HBsAb(-)] was diagnosed in 18 participants (9.6%), 53 (28.3%) were susceptible [HBsAg(-) and HBsAb(-)], 5 (3.4%) were in the gray zone [HBsAg(-) with low/inadequate HBsAb(+) titer], and the remaining 110 (58.8%) were immune [HBsAg(-)/HBsAb(+)]. Of the 18 individuals with active HBV, 13 were male and 5 were female [age range 24-66].

**Conclusion:** Despite evidence that small-group education with visual aids is effective in enhancing HBV knowledge in the Hmong population, a significant knowledge gap remained on post-education scores, suggesting that better tools or repeated interventions may be warranted. While we acknowledge that this convenience sampling may have introduced biases, the rate of active HBV infection in Wisconsin is much higher than general US population reports, and a quarter of those tested were found to be susceptible to HBV.

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## INTRODUCTION

Although the overall prevalence of hepatitis B virus (HBV) infection in the United States has decreased since the implementation of vaccination programs in the 1980s, Asian Americans still have disproportionately high infection rates. Not only are up to 1 in 10 Asian Americans infected with hepatitis B, they are also 5.5 times more likely to develop chronic hepatitis B infection compared to non-Hispanic Whites<sup>1</sup> and have the highest rate of liver cancer deaths.<sup>2,3</sup> Furthermore, foreign-born Americans from endemic countries, including most Asian countries, account for approximately 95% of new US cases.<sup>4</sup>

Among Asian ethnic groups, the Hmong have the highest prevalence of HBV, with rates as high as 1 in 5 individuals in California and Minnesota—almost double the rate of other Asian groups.<sup>5-7</sup> Additionally, the Hmong experience the

lowest survival rates due to liver cancer and tend to present at later stages of disease.<sup>8</sup> Most Hmong acquire the infection through vertical transmission or household transmission in the perinatal period, which confers a higher likelihood of chronic, often asymptomatic, disease.<sup>9-12</sup>

Hepatitis B may be identified through serologic testing, permitting early management, which may prevent liver damage and improve survival.<sup>13</sup> Testing can also identify susceptible individuals (eg, unvaccinated) at risk of contracting the virus, providing an opportunity for intervention to protect those individuals and potentially reduce the risk of future transmission.

Wisconsin has the third-largest Hmong population in the nation, with almost 14,000 Hmong residents in Milwaukee

County alone. However, the prevalence of HBV infection in the Hmong population, measured through community screenings in Milwaukee or Wisconsin, has not been documented previously.<sup>14,15</sup> Additionally, efforts in HBV education have been lacking. We set out to provide free HBV education and screening events in the Hmong community. In the process, we also aimed to assess the prevalence of HBV infection in this convenience sample of the Milwaukee-area Hmong community and determine whether small-group education sessions during these events would increase awareness and knowledge of HBV.

## **METHODS**

### **Subject Eligibility**

All adults 18 years and older who identified as Hmong were eligible for the study. Subjects were recruited during the education and screening events. All subjects provided informed consent prior to enrollment. The Medical College of Wisconsin (MCW) and Froedtert Hospital Institutional Review Board (Milwaukee, Wis) approved the study protocol.

### **Study Design and Site**

A 1-group pre- and posttest research design was used to evaluate participants' knowledge, attitude, and behavior. Participants were given a 15-point questionnaire to complete before and after intervention with HBV education sessions (see Appendix). For those who opted for screening, a cross-sectional sample was used to determine the prevalence of HBV.

Through collaboration with and feedback from local Hmong community centers and organizations, we established culturally appropriate methods of material development and education. Subjects attended 1 of 5 free education and screening events between March 2013 and December 2015. Events were held at a highly frequented Hmong market, a Hmong community church, and the annual Hmong New Year festival. Events were all scheduled on a weekend date during the late morning to afternoon based on the high level of community traffic at these locations during these times. A \$10 market gift certificate was given during the first community event to all who completed the screening. The purpose of this incentive was to increase interest and participation in the event, as this was the first screening event of its kind. Blood testing and education sessions were available at all events, but not all of those who had their blood tested participated in the education sessions or completed the pre- and post-education knowledge surveys. Similarly, not all of those who completed the surveys had their blood tested for hepatitis B.

### **Education Session**

The HBV education session consisted of a 10- to 20-minute standardized small-group (2-4 subjects) or one-on-one discussion with a physician or trained medical student. All such sessions were included in the analysis of education results. Sessions

covered hepatitis B and its prevalence, transmission routes, natural history, prevention strategies, and treatment options. Sessions were offered in both English and Hmong, with the assistance of a trained Hmong interpreter. Flow charts, illustrations, and diagrams available in both Hmong and English supplemented discussions, and participants could ask questions throughout. Educational pamphlets from the Asian Liver Center (Stanford, CA) were available for participants to take home. All forms and documents were provided in both English and Hmong. After the education session, interested participants gave consent and underwent serological testing for HBV.

### **Data Collection and Reporting**

During the event, participants filled out registration forms that included information on demographics and medical history, followed by a survey on HBV knowledge (Appendix) both before (pre-education) and immediately after (post-education) the education session. The survey was developed by study investigators and reviewed by MCW hepatologists and Hmong community members. Hmong interpreters assisted subjects in completing the surveys, which were available in both languages. Both surveys consisted of 15 questions in a "yes/no/I don't know" or multiple-choice formats. For each survey, the total number of correct answers was scored to evaluate overall knowledge about HBV, as well as knowledge of its prevalence, transmission, prevention, and natural history. One point was given for each correct answer; no points were given if individuals marked "unsure," more than 2 answers, or no answers.

If participants opted for a screening test, blood samples were collected after the education session. Samples were coded and centrifuged on-site. Serum was tested for both hepatitis B surface antigen screen and qualitative hepatitis B surface antibody by through LabCorp (Chicago, Illinois) which uses an immunochemiluminometric assay (ICMA) for both tests. Due to funding limitations, more detailed serologic testing (eg, Hepatitis B core antibody, hepatitis B e antigen, or hepatitis B e antibody) was not performed. Serological test results were divided into 4 categories as outlined in Table 1. Screening subjects were contacted with results by telephone, or confidential result letters were sent out 2 to 3 weeks following the event. Study investigators contacted all individuals with test results in the positive, susceptible, or "gray zone" categories and provided information regarding the need for physician follow-up, additional testing, and/or vaccinations; they also asked if additional assistance with insurance or ascertaining a physician was needed. Those who required vaccinations or follow-up care were sent a list of Hmong providers and free clinics in the area, along with a vaccination card to keep track of their immunizations. Investigators continued to call patients at 1-month intervals for up to 6 months after the event to assess progress on follow-up care or if contact could not be established.

**Table 1.** Serological Interpretations of Hepatitis B Lab Tests

Hepatitis B Surface Antigen (HBsAg)	Hepatitis B Surface Antibody (HBsAb)	Hepatitis B Status
Negative	Positive	Immune
Negative	Weakly positive <sup>a</sup>	Gray zone
Negative	Negative	Susceptible
Positive	Negative	Positive

<sup>a</sup> Per LabCorp testing guidelines, any antibody value that was positive on the qualitative assay but had a titer of <10 mIU/mL likely indicating susceptibility to infection.

### Statistical Analysis

Baseline characteristics of subjects were summarized using mean  $\pm$  standard deviation, median (range), and frequencies. To assess the change in overall knowledge of HBV before and after intervention, the exact Wilcoxon sign-rank test was performed on the total 15-point pre- and post-education survey scores. The same test also was performed to assess knowledge within 4 specific categories: prevalence, transmission, prevention, and natural history. Since the same subjects completed the survey before and after the education, pre- and post-education data were paired, and the McNemar test was performed to assess the intervention's effect by each question.

Univariate analysis using *t* test and analysis of variance was performed to evaluate factors associated with pre-education knowledge scores and change in knowledge score following education. Multivariate regression modeling was used to evaluate factors independently associated with pre-education score and change in knowledge score following education. A *P* value <0.05 was considered statistically significant. All analysis was performed using STATA version 8.0 (STATA Corp, College Station, Texas).

Descriptive statistics were calculated and reported for demographic variables; 95% confidence intervals were calculated for each variable.

### RESULTS

Demographic information is displayed in Table 2. The majority of participants were not born in the United States but had been living in the US for over 2 decades. A total of 187 individuals were tested for HBV and 161 completed knowledge surveys. As noted previously, those having their blood tested were not required to participate in the education sessions or to complete the surveys. Similarly, those who participated in the education sessions and/or completed the surveys were offered to have their blood tested but were not required to do so. Thus, while there was likely overlap between the groups, we did not track which individuals specifically had blood tested and which completed the surveys.

#### Survey Results

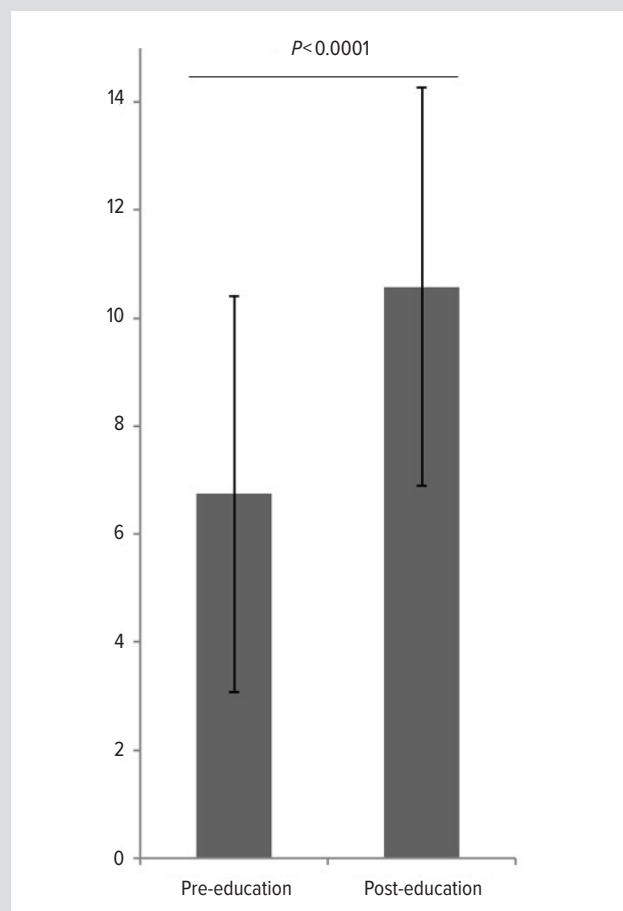
One hundred sixty-one participants completed both the pre- and post-education surveys. As shown in the Figure, there was a sta-

**Table 2.** Demographic Characteristics of Screening Participants

Variable	Positive % (n = 18)	Susceptible % (n = 53)	Immune % (n = 110)
Sex: male	72	44.2	35.5
Age <sup>a</sup>	54.2 $\pm$ 10.7	42.2 $\pm$ 16.3	47.5 $\pm$ 15
18-24	5.6	17.3	7.3
25-34	0	21.2	15.6
35-44	16.7	19.2	14.7
45-54	27.8	13.5	25.7
55-64	50	21.2	24.8
65+	0	7.7	11.9
Birth country			
Laos	83.3	55.8	76.4
Thailand	5.5	17.3	9.1
United States	0	21.2	10
Unanswered	11.1	5.8	4.5
No. of years in US <sup>a,b</sup>	26.8 $\pm$ 7.8	25 $\pm$ 11.4	27 $\pm$ 8.5
No. of persons in household <sup>a</sup>	6.9 $\pm$ 4.1	5.6 $\pm$ 2.8	5.5 $\pm$ 2.5
Have health insurance	64.7	59.6	68.2
Have primary care provider	47.1	55.8	70.9
Family member with hepatitis B	17.6	11.6	10

<sup>a</sup> Mean  $\pm$  standard deviation used for age, no of years in US, and number of persons in household.

<sup>b</sup> If born outside of the US.

**Figure.** Pre- and Post-Education Survey Scores; Number Correct

tistically significant rise in the knowledge score after the education session ( $P < 0.0001$ ). Out of a maximum of 15 points, the mean pre-education score was 6.74 (45% correct; SD 3.67) and the mean post-education score was 10.6 (71% correct; SD 3.69). Nevertheless, despite the educational session intervention immediately prior to administration of the posttest, there remained a substantial knowledge gap since, on average, subjects answered 4 to 5 questions incorrectly on the posttest. No significant trends were identified when analyzing prevalence, transmission, prevention, and natural history.

### Serologies and Prevalence

Of the 187 participants, active HBV infection [HBsAg(+) and HBsAb(-)] was identified in 18 (9.6%); 53 (28.3%) were susceptible to infection [HBsAg(-) and HBsAb(-)]; 6 (3.2%) were designated as gray zone—defined as HBsAg(-) in conjunction with low HBsAb(+) titer—which was inadequate to confirm protection. The gray zone group may indicate individuals who are (1) susceptible without prior immunization, (2) previously vaccinated, now with waned HBsAb titers, or (3) previously infected and cleared of the virus but also with waned HBsAb titers. In the absence of HBcAb (HBcAb) testing, we could not distinguish whether any fit in to this third category.

The remaining 110 patients (58.8%) were found to be immune to HBV infection and likely vaccinated [HBsAg(-) and HBsAb (+)], although without HBcAb testing we could not distinguish whether any in this group represented those with prior infection who had cleared the virus and achieved immunity.

Of those who tested positive ( $N=18$ ), the majority were men (13 vs 5 women), and less than half (47%) had a primary care provider (See Table 2). Those with HBV infection appeared to be more likely to be born outside the United States (none reported the US as their country of birth, but not all reported country of birth). Those who tested positive also seemed more likely to have a family member with HBV (17.6% [ $P < .05$ ] vs 11.6% of those susceptible, and 10% who were immune [ $P < .05$ ]) but did not appear to have a lesser rate of health insurance or a statistically significantly higher number of members in their household.

### Follow Up

Only 44.4% of patients with active HBV infection completed or scheduled an appointment with a physician at the 1.5-month follow-up point. Others indicated they planned to make an appointment in the immediate future, had health insurance but indicated a lack of a primary care provider as their reason not to follow up, or were lost to follow up due to our inability to contact them. At the 1.5-month follow-up point, 12.2% of the susceptible population had started their hepatitis B vaccination series.

## DISCUSSION

As part of free community HBV screening events, we set out to determine the prevalence of HBV infection in the Milwaukee Hmong community and assess whether small-group education would increase awareness and knowledge of HBV infection. Our project was the first to offer free education and screening for hepatitis B in the Milwaukee Hmong community. Over the course of 4 years, we conducted 5 screening events and screened a total of 187 participants. In total, 18 (9.6%) tested positive for HBV infection. These results suggest that the Hmong HBV infection rate is similar to Asian Americans as a whole (10%), though not quite at a prevalence of 1 in 5 as reported in previous studies done with Hmong Americans.<sup>5,7</sup> It is possible that some of the difference may be due to some prior studies being conducted through chart review of clinic records, which targets a different population than that which may attend a free screening event.

Moreover, 53 participants (28.3%) tested as “susceptible,” meaning they likely never received the vaccination series and are still at risk for acquiring the infection. It is true that hepatitis B surface antibody titers may wane over time after immunization, so this group may include some of those cases but would likely benefit from a booster immunization in any case. We feel strongly that identification of this large group of susceptible individuals in a community with a high rate of HBV infection presents a great opportunity for intervention by encouraging these at-risk individuals to receive vaccination.

We were not able to ascertain Wisconsin HBV susceptibility or prevalence data for the general population or subgroups. The 2013 Wisconsin Hepatitis B Surveillance Summary provided by the Wisconsin Department of Health Services does provide the cases reported to the state.<sup>16</sup> These numbers are not true “incident” or “prevalent” cases. Of the 354 total cases reported in 2013, only 7 were acute (“incident”) and 347 were nonacute; this latter group likely reflects chronic cases that were not identified previously.

While there is no specific ethnicity breakdown of the 2013 reported cases for the Hmong, those of Asian/Pacific Islander background comprised 46 % ( $n=162$ ) of the cases, whereas those categorized as White (19%,  $n=68$ ) and Black/African American (15%,  $n=54$ ) are proportionately less represented. According to the 2010 US Census, there were 49,240 Hmong persons living in Wisconsin, making up ~0.9% of the state’s population.<sup>17</sup> Since it is estimated that 38% of Asians in Wisconsin are Hmong, it is likely that a large number of the reported 2013 HBV cases are Hmong.<sup>18</sup> In conjunction with our findings, these data reinforce the concept of focusing screening and vaccination efforts on this population. These measures would identify infected cases who may require active treatment to prevent complications and would also identify those who are susceptible for vaccination, since they are potentially at higher

risk of household transmission. Such efforts also would protect the community at large from wider spread of HBV.

Screening participants also filled out 15-question surveys before and after they received a small-group education session. The Figure illustrates the significant improvement in average survey scores—from 6.7 to 10.6—among participants after the education. The data suggest that small-group education was an effective means of increasing HBV knowledge within our sample population. The survey results did suggest an initial knowledge gap that needs to be addressed. Whether this type of intervention resulted in a sustained improvement in knowledge is not evident in this study. We contemplated administering a longer term follow-up survey to assess sustainability of the increase in knowledge, but due to limited resources, concerns about biases introduced by self-selection of those more willing to participate in longer term follow-up, and concern that some would be deterred from participating due to the longer-term commitment, we did not do a longer term follow-up survey.

Follow-up for test results was, in fact, one of the more challenging aspects of our project. Difficulties included subjects lost to follow-up, patient noncompliance with recommendations, and barriers to access health care, including lack of insurance, lack of a physician, and cultural/language barriers. The initial goal of the project was to ensure that for those who test positive or susceptible for HBV, at least 60% successfully complete an appointment with a physician or complete a vaccination series. Unfortunately, less than half (44.4%) of the patients with active HBV infection completed or scheduled an appointment with a physician at the 1.5-month follow-up point. Lack of a primary care provider seemed to be a major reason for lack of follow up for the entire cohort, including those susceptible individuals who had not yet started their vaccination series.

As of 2014, the largest Hmong populations in Wisconsin are in Green Bay, La Crosse, Milwaukee, Sheboygan, and Wausau.<sup>19</sup> It is unclear how many of the people who came to the screening events were from the Milwaukee area or commuted from other cities with large Hmong populations. As the project continues to this day with involvement by new groups of MCW medical students, we hope to better identify barriers and perhaps extend our project to other Wisconsin cities with large Hmong populations.

Our study was limited by the fact that it was comprised of a convenience sample of those coming to these events, thus we cannot be certain that the group undergoing screening is reflective of the Milwaukee or Wisconsin Hmong Community in general. It is certainly possible that this group was either more educated than others or more connected to services within the community and, therefore, more apt to participate in these events. In addition, the funding limitations of this study precluded us from completing full serologic evaluation, including HBcAb testing or hepatitis B viral DNA assessment. This deficiency prevented us

from fully characterizing the status of the “gray zone” subjects. In addition, it also may have underestimated those with evidence of prior infection since some HBsAg (-) /HBsAb (+) may not have been vaccinated but rather developed natural immunity after a resolved infection. Identifying those with resolved infection may be helpful in targeting family members who should definitely be tested for HBV. As discussed previously, we may also have overestimated the subjects who were unvaccinated, since hepatitis B surface antibody titers are known to wane—particularly in those who may not be fully immunocompetent. If able to procure more funding in the future, we intend to perform more detailed serologic evaluation with reflex HBV testing when HBsAg positive status is detected. We also intend to develop better measures to ascertain follow up of screened subjects and, if feasible, administer longer interval follow-up surveys.

The absence of any reported US-born subjects with active HBV infection may provide an opportunity to better focus limited screening resources. In addition, the low overall rate of health insurance and a lower likelihood of affiliation with a primary care provider for those with HBV infection also provide potential opportunities for impactful interventions.

## CONCLUSION

Overall, our results show that hepatitis B infection remains a prominent health issue in the Milwaukee and likely Wisconsin Hmong community, and additional outreach and screening events are needed to help identify at-risk members of this population. Particularly because many HBV patients—especially immigrants and minorities—often do not receive the recommended levels of care, there is a critical need for developing culturally appropriate and effective strategies that can be incorporated into existing clinical practice.

Public health services are needed to enhance HBV surveillance in the Milwaukee Hmong community, formulate strategies for effective vaccination and post-exposure prophylaxis, and to provide better access and linkage to care. We believe implementation of such measures will diminish the disease burden and the expected sequelae of untreated HBV, including cirrhosis and its myriad complications such as decompensated liver disease (ascites, portosystemic encephalopathy and variceal bleeding) and hepatocellular carcinoma—all of which are associated with a higher mortality rate.

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