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Pediatrics 1999;104:1212-1216

DOI: 10.1542/peds.104.5.S1.1212

This information is current as of May 9, 2005

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Differences in Knowledge of Hepatitis B Among Vietnamese, African-American, Hispanic, and White Adolescents in Worcester, Massachusetts

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Abstract. Objective. To assess the level of knowledge about hepatitis B of Vietnamese adolescents, a group at high risk for hepatitis B, and compare it to the knowledge of adolescents of other races and ethnicities.

Methods. A sample of 2816 adolescents was surveyed in 1993 in 2 middle schools and 2 high schools in Worcester, Massachusetts, using a self-administered multilingual questionnaire.

Results. Knowledge of hepatitis B was low overall. Vietnamese respondents were more likely than were other students to know that hepatitis B affects the liver (35.6% vs 22.6%). However, they were much less likely than were other students to correctly identify sex with an infected person as a risk factor for infection (13.7% vs 32.8%). Independent predictors of this knowledge were: white race; older age; attending high school versus middle school; having been taught about hepatitis B in school; knowing the definition of hepatitis B; reporting better grades; having a family member with hepatitis B; and being more highly acculturated.

Conclusions. Adolescent knowledge about risk of infection was low in this study. Attention should be directed at providing health education on hepatitis B to adolescents, particularly to Vietnamese. Health care providers, community health educators, and others engaged in the effort to control and eradicate hepatitis B should be sensitive to the unique educational and cultural needs of high-risk southeast Asian adolescent populations. *Pediatrics* 1999;104:1212-1216; *adolescent behavior, health surveys, health promotion, Asians, Asian Americans, Vietnam, hepatitis.*

ABBREVIATIONS. ORs, odds ratios; CIs, 95% confidence intervals.

Reduction of hepatitis B infection is a national public health priority.¹ Hepatitis B infection may result in acute and chronic morbidity and mortality. Neonatal hepatitis B infection frequently persists in a chronic carrier state, and confers significant risk of morbidity and mortality from liver disease, such as cirrhosis and hepatocellular carcinoma in early adulthood.^{2,3} Infection with hepatitis B during adolescence and adulthood is associated with a lower risk of chronic infection

but, is an important public health problem. In the United States, >330 000 new cases of hepatitis B occur per year.⁴ Approximately 70% of new hepatitis B infections occur in adolescents and young adults.⁵

Once infection occurs, transmission can occur horizontally via contact with blood products, through sexual contact and even through apparent casual contact in the household.⁶ Strategies to prevent transmission from persons already infected include: immunization of nonimmune individuals; identification of persons with chronic infection with targeted health education to reduce transmission to household, sexual, and vertical contacts; and at a community level, promotion of safe sex practices including the use of condoms.

Seroprevalence studies have demonstrated that specific populations are at particularly high risk of hepatitis. Highest risk are persons from southeast Asia with a seroprevalence of 12% to 16%.⁷ Since 1975, >1 million refugees and immigrants have emigrated from southeast Asia to the United States. Over a half (59%) of southeast Asians who have come to this country originated from Vietnam, of whom more than one quarter were children.⁸ The Vietnamese population in the United States increased by more than twofold between 1980 and 1990,⁹ and is projected to reach 4 million by the year 2030¹⁰ attributable to fertility and continued immigration.

Relatively few studies have focused on the health status and health behavior of Vietnamese or other Asian Americans, and little effort has been directed at health education on hepatitis for southeast Asian adolescents. Asian children are relatively under-vaccinated for hepatitis B.¹¹ Development and implementation of effective clinical and public health prevention strategies for hepatitis B are predicated on an understanding of the knowledge and attitudes among adolescents regarding hepatitis B infection. In particular, we need a better understanding of Asian American adolescents' perception of the risk of sexually transmitted hepatitis B, given the historical reticence of persons from Asian cultures to discuss sexuality and death and dying openly.¹² This article reports the results of a survey designed to assess knowledge of hepatitis B infection by Vietnamese American adolescents, and to compare their knowledge with other racial and ethnic subgroups of adolescents.

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Received for publication Mar 29, 1999; accepted Jun 29, 1999.

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METHODS

Study Population

Worcester, Massachusetts, is a city of 169 759 (of whom 1.2% are Vietnamese)¹³ located in central Massachusetts. The target population for this survey administered in 1993 (part of a larger study on health knowledge and practices) consisted of all students at 2 public high schools and 2 public middle schools in Worcester. These schools were selected as having the greatest number of southeast Asian students, according to school department records. The schools selected represented 66% of the total Asian middle school and high school population. The study was reviewed and approved by the Institutional Review Board of the University of Massachusetts School of Medicine. Parents were given the opportunity to exclude their child from the survey via a mailed notification form. Subjects were instructed that their participation was voluntary and that they could withdraw from the survey at any time without penalty. A total of 2816 students returned completed surveys, for an overall response rate of 80% of enrolled students. The response rate was 83% in each of the middle schools and 89% and 68% in the 2 high schools. The overall response rate as a percentage of students present on the day of survey administration was 92%. Fifteen students declined participation, and none withdrew during the survey.

Survey Instrument

All items were presented in English, Spanish and Vietnamese. Each question was visible in 3 languages at all times. The instrument was translated to Vietnamese by a team of experienced Vietnamese health educators and then back translated into English and discrepancies resolved in a group process. In addition, individual Vietnamese American students pretested the survey to ensure student understanding of all questionnaire items. Spanish translation was done by a professional English-to-Spanish survey translation firm. Questions on hepatitis B were designed to assess basic knowledge about the infection and past screening, and included: identification of the correct definition of hepatitis B ("infection of the liver"); identification of an efficient potential route of infection relevant to adolescents ("having sex with someone who has hepatitis B"); awareness of blood testing for hepatitis B; knowledge of the results of blood

test for hepatitis B if tested; and family members' previous diagnosis of hepatitis B. Students were also queried regarding exposure to school-based curriculum on hepatitis B. Race/ethnicity was reported as Black, Vietnamese, Cambodian, Hispanic, White, Chinese, or other. Acculturation was approximated by self-report of how well English was spoken; language use is a reasonable indicator of acculturation in southeast Asian and other populations.¹⁴ The survey was administered by school personnel in lieu of regularly scheduled classes, or during an extended morning homeroom period. It was self-administered anonymously with a separate op-scan answer sheet.

Statistics and Modeling

Data were entered and analyzed with Paradox 3.5 (Borland; Scotts Valley, CA), EPI INFO 5.0 (Centers for Disease Control and Prevention; Atlanta, GA), Egret (Statistics and Epidemiology Research Corporation; Seattle, WA), SAS (SAS Institute; Cary, NC). Differences between proportions are reported as odds ratios (ORs); 95% confidence intervals (CIs) of ORs were calculated using normal approximation or exact methods as appropriate. Associations between independent and dependent variables were determined by logistic regression models.

RESULTS

Characteristics of the Sample

The respondents identified their race/ethnicity as follows: 226 (8.1%) Vietnamese; 263 (9.4%) African-American; 545 (19.4%) Hispanic; 1615 (57.5%) White; and 158 (5.6%) other race/ethnicity including Chinese and Cambodian. Of the Vietnamese, 87% reported their place of birth as Vietnam, 9% the United States, and remainder in other southeast Asian countries. Additional characteristics are found in Table 1. Half of Vietnamese respondents had been in the United States for 5 years or less. Students >15 years old reported residence in the United States for less time than did younger

TABLE 1. Characteristics and Knowledge of Hepatitis B Among Middle and High School Students, Worcester, Massachusetts, 1993

	Vietnamese N = 226	White N = 1615	African- American N = 263	Hispanic N = 545
Age (y)				
12 and younger	8 (3.6)	210 (13.0)	18 (6.9)	64 (11.8)
13–15	92 (41.1)	820 (50.8)	141 (54.0)	346 (63.6)
16–18	74 (33.0)	567 (35.1)	96 (36.8)	121 (22.2)
>19	50 (22.3)	18 (1.1)	6 (2.3)	13 (2.4)
Time in United States (y)				
<1	25 (11.2)	14 (.9)	7 (2.7)	24 (4.4)
1–2	43 (19.2)	15 (.9)	11 (4.2)	29 (5.3)
3–5	43 (19.2)	24 (1.5)	19 (7.3)	70 (12.8)
6–9	49 (21.9)	21 (1.3)	12 (4.6)	91 (16.7)
>10	64 (28.6)	1537 (95.4)	211 (81.2)	331 (60.7)
Acculturation—ability to speak English				
None	7 (3.1)	8 (.5)	2 (.8)	10 (1.9)
Poor	59 (26.5)	9 (.6)	3 (1.2)	38 (7.0)
Fairly well	86 (38.6)	56 (3.5)	23 (8.9)	113 (20.9)
Very well	71 (31.8)	1534 (95.5)	232 (89.2)	379 (70.2)
Below average school performance	17 (8.4)	163 (10.4)	29 (11.9)	63 (12.7)
Knowledge of definition of hepatitis B				
Correct	73 (35.6)	396 (25.4)	52 (21.0)	75 (14.9)
Incorrect	30 (14.6)	209 (13.4)	61 (24.6)	90 (17.9)
Don't know	102 (49.8)	954 (61.2)	135 (54.4)	337 (67.1)
Knowledge of sexual contact as hepatitis B risk factor				
Correct	31 (15.0)	583 (37.5)	87 (35.4)	141 (28.0)
Incorrect	60 (29.0)	127 (8.2)	35 (14.2)	67 (13.3)
Don't know	116 (56.0)	846 (54.4)	124 (50.4)	295 (58.7)
Ever had blood test for hepatitis B	81 (36.3)	143 (9.0)	37 (14.5)	64 (12.2)
Household member has ever had hepatitis B	13 (5.9)	43 (2.7)	11 (4.3)	23 (4.4)
Ever taught in school about hepatitis B	48 (24.0)	443 (29.1)	84 (36.2)	132 (27.8)

students. About one third reported speaking English poorly or not at all, and 40% made use of at least some Vietnamese translation while completing the survey.

Knowledge of Definition of Hepatitis B

Among all students, the rate of correctly identifying the definition of hepatitis B was low (23.6%). There was no significant difference between girls (24.0%) and boys (22.1%). Vietnamese respondents were more likely than were other students to know the definition of hepatitis B, (35.6% vs 22.6%; OR = 1.89, 95% CI 1.38, 2.58; $P < .001$). Students in middle school were less likely than were students in high school to answer correctly (15.4% vs 30.6%, OR = .41, 95% CI = .34, .50; $P < .001$), as were students <16 years old (19.8% vs 30.5% among students 16 years and older, OR = .56, 95% CI = .47, .68; $P < .001$).

Students who reported having been tested for hepatitis B were more likely to correctly identify the definition of hepatitis than were those students who did not report having been tested (34.4% vs 22.1%; OR = 1.85, 95% CI = 1.43, 2.39, $P < .001$). Several other factors associated with knowledge of hepatitis are presented in the regression models discussed below.

Knowledge of Risk Factor for Hepatitis B

Sexual contact with an infected person was correctly identified as a risk factor for infection by 880 (31.3%) of respondents (Table 1). Fewer of middle school students (16.5%) than high school students (44.1%) answered correctly (OR = 3.94, 95% CI = 3.28, 4.74; $P < .001$). Students aged 16 or older were more likely than were younger students to answer correctly (43.2 vs 24.4%; OR = 2.38, 95% CI = 2.00, 2.82; $P < .001$). There were no significant gender differences for this variable.

Vietnamese respondents were much less likely than were other students to correctly identify sexual transmission as a risk factor (13.7% vs 32.8%, OR = .33, 95% CI = .22, .50, $P < .001$). Additional factors associated with knowledge of source of infection are presented in the regression models discussed below. Rates of having been taught about hepatitis B are presented in Table 1. Middle school students were less likely than were high school students to report hepatitis B education (14.8% vs 36.7%; $P < .001$).

Regression Models

A number of factors were independently associated with knowledge about hepatitis B (Table 2). Relative to white students (the largest comparison group), after adjustment for school level, having received education about hepatitis B, having been tested for hepatitis B, and gender, Vietnamese subjects were more likely to know the definition of hepatitis B (adjusted OR = 1.52), and Hispanic Americans were less likely. The unadjusted OR for Vietnamese students relative to whites was 1.62, indicating that the other variables in the model did not strongly confound this association. Males were

TABLE 2. Independent Predictors of Knowledge of Definition of Hepatitis B Among Middle and High School Students, Worcester, Massachusetts, 1993

Variable	Odds Ratio	95% Confidence Interval	P
Vietnamese	1.52	1.09, 2.12	.014
African-American	.76	.54, 1.07	.113
Hispanic	.55	.42, .74	<.001
White	1.0	—	—
High school student	1.89	1.54, 2.32	<.001
Taught about hepatitis B in school	1.98	1.30, 2.25	<.001
Tested for hepatitis B	1.71	1.32, 2.27	<.001
Male	.80	.66, .97	.022

less likely than females to correctly respond to this item. High school students and students who reported having been tested for hepatitis B were more likely to correctly identify the nature of hepatitis B infection. The strongest predictor overall was having been taught in school about hepatitis B.

In a regression model, after controlling for age, having received education about hepatitis B, knowledge of definition of hepatitis B, poor academic performance, reported family member with hepatitis B, school level, and poor spoken English, Vietnamese students continued to be significantly less likely than all other groups to correctly identify sex with an infected person as a risk factor for infection with hepatitis B (relative to whites, adjusted OR = .23; unadjusted OR = .29; see Table 3). Hispanic respondents were also less likely than whites to correctly identify this risk factor. The strongest predictor of identifying sex as a risk factor was having been taught about hepatitis B in school. Students who reported below average school performance, and those reporting poor spoken English, were much less likely to identify this risk factor.

To assess literacy effects on question comprehension, rates of missing data were examined. Vietnamese American subjects were more likely than were other subjects to leave blank the item on sex-

TABLE 3. Independent Predictors of Knowledge of Sexual Contact as a Risk Factor for Infection with Hepatitis B. Middle and High School Students, Worcester, Massachusetts, 1993

Variable	Odds Ratio	95% Confidence Interval	P
Vietnamese	.23	.14, .38	<.001
African-American	.81	.57, 1.13	.209
Hispanic	.72	.55, .95	.018
White	1.0	—	—
Age 16 years or older	1.33	1.04, 1.72	.025
Taught about hepatitis B in school	4.02	3.27, 4.94	<.001
Knew definition of hepatitis B	2.34	1.88, 2.91	<.001
Academic performance*	.88	.83, .95	<.001
Family member had hepatitis B	1.95	1.15, 3.31	.013
High school student	2.61	2.00, 3.40	<.001
Poor speaking English	.35	.29, .50	.002

* Scaled as 7 levels, from "one of the best", to "near the bottom" compared to other students in respondent's class. O.R. indicates risk associated with change in one level.

ual transmission of hepatitis B (8.4% vs 4.9%; $P = .022$). However, the rate of missing data on this item for Vietnamese was no different from the rate of missing data for questions judged to have less complex vocabulary.

DISCUSSION

Subjects in this study demonstrated an overall low level of knowledge about hepatitis B. Vietnamese adolescents were more likely than were other students to identify the definition of hepatitis B, although only about one third were able to do so. Moreover, Vietnamese youth, who have the highest seroprevalence of hepatitis B, were much less likely to identify a critical risk factor for transmission: sexual contact with an infected person.

Respondents who reported having been taught about hepatitis B in school were much more likely to know both the definition of hepatitis B and to correctly identify a source of transmission, lending indirect support to school-based efforts to educate adolescents about hepatitis B. During the year before this study, health education on hepatitis B had been presented to Vietnamese high school and middle school students during informal group sessions as part of an Asian youth health fair. Otherwise, hepatitis B was not a formal component of the schools' health education at the time of this study, and had not been introduced at the time of publication of this study.

Other factors were identified that should help identify adolescents worthy of particular attention from health educators, pediatricians, and other providers of health care to adolescents: less acculturation, as indicated by low English proficiency; attendance in middle school; age <16 years; and below average performance in school. Students with these characteristics were even less likely to identify the risk factor for transmission of hepatitis B, and may benefit from programs targeted specifically to them with appropriate attention to cultural competence, curricular complexity, and language of presentation.

Each year, approximately 5000 persons in the United States die of cirrhosis of the liver related to hepatitis B, and another 1500 die of liver cancer related to hepatitis B.¹⁵ Hepatitis B viral DNA can integrate into DNA leading to oncogenicity, resulting in hepatitis B being the most common cause of liver cancer worldwide.¹⁵ Efforts to control hepatitis B include: screening of pregnant women to interrupt vertical transmission; vaccination starting at birth; immunization of 11- to 12-year-olds and high-risk populations; screening of blood and other tissue products; community-based health education to identify persons appropriate for screening or vaccination; primary care-based health education to effect risk factor modification and lifestyle change; and appropriate medical management of hepatitis B carriers. There is evidence that this strategy is effective. A decrease has occurred in the incidence of liver cancer in areas that have implemented hepatitis B vaccination programs.¹⁶ According to the Centers for Disease Control and Pre-

vention, hepatitis B vaccine is the first vaccine that prevents a type of cancer.¹⁷ Maintenance of a high vaccine coverage rate is a goal of *The Initiative to Eliminate Racial and Ethnic Disparities in Health*.¹⁸ Vaccination of adolescents in geographic regions of high and average incidence of hepatitis B is economically attractive.¹⁹ Hepatitis B vaccination of adolescents should be done as part of a routine vaccination visit between the ages of 11 and 12 years.¹¹ The design and implementation of effective and efficient public health interventions to control hepatitis B is predicated on an understanding of the target population's knowledge of hepatitis B.

The data presented in this study will be relevant to public health and medical professionals in the design of prevention programs at the primary (prevention of infection), secondary (early detection), and tertiary (treatment) levels. To be effective, such efforts must be sensitive to the cultural attributes of Vietnamese and other Asian adolescents with respect to sexual behavior and communication.²⁰ Culturally appropriate community health education, and health care provider-delivered education, will reflect that it may not be acceptable for Asians to discuss sexuality openly, and that communication about prevention of sexually transmitted disease between Asian sexual partners is limited.²¹ In the experience of the author, small same-sex discussion groups on hepatitis B prevention led by peers or young adults are well received by adolescents. Other effective community-based strategies include multidisciplinary efforts using mass media strategies, combined with efforts to address access barriers to immunization.²²

Pediatricians and family physicians can increase the effectiveness of their counseling of Asian adolescents by using well trained, confidential, medical interpreters when appropriate. Developing an understanding of the impact of cultural norms on adolescent behavior and on adolescents' expectations of the clinical encounter will also help physicians communicate with patients from different cultures. Understanding can be promoted by asking the patient to educate the physician about his or her culture, including cultural, family and religious expectations regulating youth behavior, and conflicts arising from these norms when they confront western lifestyles. This approach will also dispel stereotypes and increase trust between adolescents and health care providers. Oftentimes, the discussion can subsequently progress smoothly to sensitive subjects such as prevention of sexually transmitted diseases.

Several limitations of this study are worth noting. Because of restrictions on inclusion of survey questions about sexual activity, we were not able to inquire about actual patterns of condom use, or patterns of sexual activity. All data are self-reported, and we were not able to validate responses to questions about family members, or about personal testing for hepatitis B. It is possible that students may have confused hepatitis B with other types of hepatitis. Students with low literacy levels, and some younger students in middle

school, may have had difficulty with item comprehension. Although this study is based on a local sample in Worcester, Massachusetts, we have reason to believe the findings apply more broadly. The generalizability of this report is supported by similarities observed between other characteristics of this sample, such as smoking, with patterns observed in studies sampling larger or geographically dissimilar populations of adolescents.²³ However, it is possible that hepatitis B education and characteristics of adolescents elsewhere may differ from patterns observed in Worcester.

Overall, these results suggest that more attention should be addressed at providing health education on hepatitis B to adolescents, and particularly to Vietnamese American and Hispanic adolescents. A rational health education strategy would incorporate hepatitis B education with human immunodeficiency virus health education programs as the risk factors are similar. It will also continue to be critical to screen at-risk individuals for hepatitis B to identify chronic carriers. Such individuals require individual counseling to reduce the risk of sexual and household transmission, as well as careful ongoing screening, treatment where appropriate, and health education for lifestyle modification to reduce the risk of morbidity and mortality from hepatocellular carcinoma and cirrhosis.

Future studies should focus on developing a better understanding of risk behaviors among those at highest risk of hepatitis B infection, including southeast Asian American adolescents and young adults (particularly the foreign-born) to help guide development of effective school and community-based health education methods and curriculum. In addition, the goal of reducing short- and long-term consequences of hepatitis B infection and eventual eradication can be promoted by developing strategies to better equip providers of adolescent health services with the knowledge, attitudes, and skills to provide effective preventive and therapeutic services to at-risk adolescents.

ACKNOWLEDGMENTS

This work was supported by a Research Fellowship with the Institute for Asian American Studies, University of Massachusetts, Boston, and by the American Cancer Society, through a Cancer Control Career Development Award for Primary Care Physicians.

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Pediatrics 1999;104:1212-1216

DOI: 10.1542/peds.104.5.S1.1212

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