

CARDIOVASCULAR DISEASE RISK FACTOR AWARENESS IN AMERICAN INDIAN COMMUNITIES: THE STRONG HEART STUDY

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Objective: To use data from the longitudinal Strong Heart Study (SHS) to determine the level of awareness about risk factors for heart disease among 13 populations of American Indians in Arizona, Oklahoma, and South/North Dakota. The aim of this study is to assess awareness of nine major risk factors for heart disease among participants in SHS.

Methods: During July 1993 to December 1995 (phase II of SHS), 3638 participants ages 46 to 80 years (mean age 60) were asked if nine known risk factors for cardiovascular disease affect a person's chances of getting heart disease; 3226 (89%) participants completed the study and met the method reliability criteria for inclusion.

Results: Among each of the nine risk factors, the percentage of correct answers provided by study participants ranged from 70% (family history of heart disease) to 90% (being very overweight). Participants with hypertension (90% vs 86%, $P < .05$) and diabetes mellitus (81% vs 71%, $P < .05$) were more likely than those without these disorders to know they were heart disease risk factors. For all nine risk factors, the percentage of correct answers was lower ($P < .05$) among smokers than among nonsmokers. In multivariate logistic regression analyses, female sex, advanced education, and being from Oklahoma were significantly associated with heart disease awareness.

Conclusion: Although overall risk factor awareness for heart disease was high, subgroups were identified who could benefit from culturally appropriate health education and other interventions to motivate health prevention actions, especially for smoking. (*Ethn Dis.* 2006;16:647-652)

Key Words: Awareness, Behavior, Chronic Disease, North American Indians, Tobacco

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death among American Indians.^{1,2} The proportion of premature deaths attributed to heart disease is higher among American Indians/Alaska Natives than in any other racial group.³ Furthermore, American Indians are experiencing an epidemic of CVD, and without aggressive prevention programs, CVD mortality and morbidity will continue to increase.⁴ Several risk factors for CVD are modifiable, eg, smoking, physical activity, and diet. Individual behavior can be targeted to reduce and/or eliminate modifiable risk factors for CVD; therefore, determining what people know about risk factors is a worthwhile endeavor. Heart disease risk factor knowledge is the first step in risk factor reduction.⁵ In some populations, smokers and people who are overweight are more likely to identify these respective risk factors for heart disease.^{6,7} However, knowledge does not always lead to behavior change that reduces risk.^{8,9}

We are aware of only one other study that describes heart disease risk factor knowledge in American Indian communities.¹⁰ Among American Indians, variations in risk factors for CVD exist both culturally and regionally.¹¹ American Indians/Alaska Natives have the highest prevalence of cigarette smoking among both youths (28%) and adults (40%) in the United

States.¹² Although smoking prevalence varies in American Indian tribal groups (eg, northern Plains tribes have higher rates than southwest tribal groups), the average number of cigarettes smoked per day by American Indians is less than the US average.¹³ Zepher et al found dietary patterns for American Indians to be associated with high risk for CVD, due in part to the lack of, or expensive cost of, fresh fruits and vegetables in rural American Indian communities.¹⁴

The aim of the current study is to assess awareness of nine major risk factors for heart disease among participants in the Strong Heart Study (SHS). Multivariate logistic regression was used to examine the association between heart disease risk factor awareness and regional centers, education, sex, age, American Indian heritage, native language, and use of traditional (American Indian) medicine.

METHODS

Study Population and Data Sources

Strong Heart Study (SHS) phase I, conducted during 1989-1991, was the first large multicenter study to examine CVD morbidity/mortality and risk factors in 13 American Indian tribal groups: Ak-Chin Papago/Pima, Apache, Caddo, Cheyenne River Sioux, Comanche, Delaware, Fort Sill Apache, Gila River Pima/Maricopa, Kiowa, Oglala Sioux, Salt River Pima/Maricopa, Spirit Lake, and Wichita. These groups reside in one of three regional centers: Arizona, southwestern Oklahoma, and South Dakota/North Dakota.^{13,15}

SHS phase II study population includes 3638 phase I participants who

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were re-examined between July 1993 and December 1995. Self-reported data (eg, sex, date of birth, years of education, American Indian heritage [blood degree quantum], traditional [American Indian] medicine use, and ability to speak native [American Indian] language) were retained from phase I. Medical chart health history ascertained congestive heart failure, coronary heart disease, myocardial infarction, hypertension, and diabetes mellitus.¹⁵ Cigarette smoking was self-reported from phase II.

To assess awareness about heart disease risk factors among SHS phase II participants, a heart disease risk factor knowledge questionnaire, developed by the National Center for Health Statistics, was administered.¹⁶ For questions about each of nine risk factors associated with heart disease (being very overweight, cigarette smoking, diabetes mellitus, family history of heart disease, high blood pressure, high cholesterol, high-fat diet, not exercising regularly, and worry/anxiety/stress) participants chose one of the following responses: increases risk, does not increase risk, or don't know/not sure.

Survey Mode

Seventy-two percent of the heart disease awareness questionnaires were interviewer-administered, while 28% were self-administered. All SHS forms and questionnaires were printed in English. Participants who self-administered the questionnaire were deemed to have capable cognitive skills by SHS

clinic staff. Self-administered questionnaires aided in the overall SHS clinic exam flow. Number of interviewer-administered questionnaires that were translated into native language was not documented; however, we are aware of very few. Pyne et al found consistency across responses among interviewer- and self-administered questionnaire formats for a quality of well-being scale.¹⁷ Furthermore, Schweigman et al found no clear advantage in the use of a self-administered versus interviewer-administered questionnaires among SHS participants.¹⁸

Interviewers were predominantly American Indian and members of the participating SHS communities. Training and quality control of interviewers followed SHS protocol.^{19,20}

Reliability of Responses

Reliability of participant answers was subjectively judged by the interviewer immediately after the interviewer-administered demographic and cultural questionnaire by selecting one of the following five categories: very reliable, reliable, unreliable, very unreliable, or uncertain. Only very reliable and reliable responses were used for this study. Interviews judged to be of lower reliability were generally the result of impaired cognitive ability, ie, language barriers. The risk factor knowledge questionnaire did not contain an option for participant reliability. However, all nine questions had to be answered to be included in the study.

Subject Participation

Among the 3638 eligible participants, 3226 (88.7%) were included in the data analysis. A total of 412 participants were excluded from the analysis either if they refused to complete the risk factor questionnaire ($n=129$) or if one or more of the following applied: respondent did not answer questions for all nine of the heart disease risk factors, other key data items were missing, or the respondent was

considered by the interviewer not to be reliable ($n=283$).

Data Analysis

Data were analyzed using SAS version 8.1 for Windows.²¹ The association of heart disease awareness with disease status (heart disease vs no heart disease, hypertensive vs normotensive, diabetic vs nondiabetic) and a lifestyle habit (smoker vs nonsmoker) was analyzed by using the chi-square test. Multivariate logistic regression was used to examine the association between heart disease awareness and regional centers, education, sex, age, American Indian heritage, native language, and use of traditional (American Indian) medicine. Three of these were continuous variables (age in years, education in years, and percent of American Indian heritage), while two were categorical variables (South Dakota/North Dakota as reference group for regional centers and women as reference group for sex). The remaining two variables were dichotomous, native language (does not speak vs does speak but not fluently or can fluently speak) and traditional medicine use (never or seldom vs often, almost always or always). Does not speak native language is the reference group for native language. An odds ratio (OR) <1 indicates greater risk factor knowledge compared to the referent group and an OR >1 indicates less knowledge compared to the referent group. P values $\leq .05$ and ORs whose 95% confidence intervals did not include 1 were considered to be statistically significant.

RESULTS

Participant characteristics by regional center are listed in Table 1. Among the 3226 study participants, 62% were female and 38% were male. The age of participants ranged from 46 to 80 years, with the mean age of 60 (Table 1).

Overall, positive answers for risk factor knowledge ranged from 70% for

Table 1. Participant characteristics by regional center (AZ, OK, SD/ND) and overall

Participant Characteristics	Regional Center			Overall
	AZ	OK	SD/ND	
Number of participants	1044	1121	1061	3226
Age mean, years (SD)	59.4 (7.9)	60.5* (8.1)	59.7 (7.6)	59.9 (7.9)
Education mean, years (SD)	10.2 (2.8)	12.4* (2.7)	11.0* (3.0)	11.2 (3.0)
Female sex (%)	67.1*	59.5	58.9	61.8
Native language speaker (%)	88.6*	58.7*	75.2*	73.8
Use traditional medicine (%)	7.4	7.5	13.9*	9.6
Current smoker (%)	16.0*	30.2*	44.2*	30.2
Have heart disease † (%)	30.8	31.2	36.5*	32.8
Have hypertension (%)	52.1	48.2	38.7*	46.3
Have diabetes (%)	70.4*	44.7	46.3	53.5

* Denotes statistically significant difference ($P \leq .05$) among regional centers.

† Heart disease was defined as congestive heart failure, coronary heart disease, or myocardial infarction.

AZ=Arizona; OK=Oklahoma; SD/ND=South Dakota/North Dakota; SD=standard deviation

family history of heart disease to 90% for being very overweight. Heart disease risk factor awareness was higher, but not statistically significant, among participants without heart disease than those with heart disease for five of the nine risk factors: being very overweight, cigarette smoking, high blood pressure, high cholesterol, and not exercising regularly (Table 2). Participants with a health condition related to heart disease (hypertension and diabetes mellitus) had significantly more knowledge of the corresponding risk factor than individuals without the condition (Table 2). A significantly higher proportion of participants with hypertension knew that diabetes, high blood pressure, and not exercising regularly were heart

disease risk factors than individuals without hypertension (Table 2). Participants with diabetes mellitus had significantly more knowledge of diabetes as a heart disease risk factor; on the other hand, diabetics knew significantly less about family history of heart disease as a risk factor (Table 2). A significantly higher proportion of cigarette smokers were less likely to know heart disease risk factors than nonsmokers for all nine risk factors (Table 2).

In multivariate logistic regression analyses, the three variables that showed the most consistent association with heart disease awareness were female sex (nine of nine protective ORs), higher education (nine of nine protective ORs), and being from Oklahoma (nine

of nine protective ORs) (Table 3). Having more American Indian heritage (blood degree quantum) is associated with increased risk of not knowing heart disease risk factors for four (being very overweight, high blood pressure, not exercising regularly and worry/anxiety/stress) of the nine risk factors (Table 3). However, having a higher American Indian heritage is associated with knowledge of diabetes as a heart disease risk factor (Table 3). Speaking native language is associated with increased risk of not knowing heart disease risk factors for two (cigarette smoking and family history) of the nine risk factors (Table 3). For every year of age, the risk of not knowing cigarette smoking is a heart disease risk factor increases by 2% (Table 3).

DISCUSSION

Overall, risk factor awareness was high, ranging from 71% to 90%. Participants with hypertension (90% vs 86%, $P < .05$) and diabetes mellitus (81% vs 71%, $P < .05$) were more likely than those without these disorders to know they were heart disease risk factors. Diabetes is strongly linked to heart disease. American Indian men and women with diabetes had respectively a 2.2-fold and a 3.4-fold increased risk for CVD compared to those without

Table 2. Heart disease risk factor (% with awareness) in those with and without medical chart history health condition of heart disease, high blood pressure, diabetes, and self-reported smoking

Risk Factor	Heart Disease vs No Heart Disease		Hypertension vs No Hypertension		Diabetes vs No Diabetes		Smokers vs Nonsmokers	
Being very overweight	90	91	90	90	91	90	88*	91*
Cigarette smoking	85	87	87	86	87	86	83*	88*
Diabetes	76	76	78*	74*	81*	71*	69*	79*
Family history	70	70	70	70	69*	72*	68*	71*
High blood pressure	87	88	90*	86*	88	87	84*	89*
High cholesterol	83	84	84	83	84	83	79*	86*
High fat diet	86	84	85	84	85	84	81*	86*
Not exercising regularly	84	85	86*	84*	85	85	80*	87*
Worry/anxiety/stress	83	82	82	82	82	82	78*	84*

The percentage of participants with knowledge of a risk factor was based on the number of respondents for each question (missing data were excluded).

* Denotes statistically significant difference ($P \leq .05$) between those who reported the health condition and those who did not.

Table 3. Multivariate logistic regression of heart disease risk factor awareness: significant odds ratios by sociodemographic attributes and cultural factors†

Specific Risk Factor		*Center		Education (year)	*Sex	Age (year)	American Indian Heritage (%)	*Native Language
		Arizona	Oklahoma					
Being very overweight	OR		.32	.86	2.07		1.01	
	CI		.23-.45	.82-.90	1.63-2.64		1.00-1.01	
Cigarette smoking	OR		.50	.88	1.52	1.02		1.44
	CI		.38-.66	.85-.91	1.23-1.87	1.01-1.04		1.08-1.93
Diabetes	OR		.46	.93	1.42		.99	
	CI		.38-.57	.91-.96	1.20-1.68		.99-.99	
Family history	OR		.56	.89	1.53			1.35
	CI		.46-.67	.86-.91	1.30-1.79			1.11-1.64
High blood pressure	OR		.38	.85	1.33		1.01	
	CI		.28-.51	.82-.89	1.07-1.65		1.00-1.01	
High cholesterol	OR		.28	.87	1.53			
	CI		.21-.37	.84-.90	1.26-1.86			
High fat diet	OR		.28	.91	1.99			
	CI		.21-.36	.88-.94	1.63-2.43			
Not exercising regularly	OR	.67	.26	.90	1.42		1.01	
	CI	.53-.84	.19-.35	.87-.93	1.16-1.74		1.00-1.01	
Worry/anxiety/stress	OR		.29	.88	1.78		1.01	
	CI		.22-.38	.85-.91	1.47-2.15		1.00-1.01	

Only significant odds ratios are shown on the table with all values rounded.

* Referent group for center is North/South Dakota, for sex is female, and for native language is those who cannot speak native language.

† Traditional medicine was part of the multivariate logistic regression model but did not show significant results.

OR=odds ratio; CI=95% confidence interval (Wald confidence interval).

diabetes.²² Age, albuminuria, hypertension, and low-density lipoprotein cholesterol are also significantly linked to CVD in American Indians of both sexes.²² Smokers were less likely than nonsmokers to know, or acknowledge, that any of the nine attributes were risk factors for heart disease ($P<.05$). In multivariate logistic regression analyses, the three variables that showed the most consistent association with heart disease knowledge were female sex (nine of nine protective ORs), higher education (nine of nine protective ORs), and being from Oklahoma (nine of nine protective ORs). Those with a greater degree of American Indian heritage have increased risk of not knowing heart disease risk factors for four of the nine risk factors (being very overweight, high blood pressure, no regular exercise, and worry/anxiety/stress), but they are more aware of diabetes as a heart disease risk factor.

Speaking native language is associated with increased risk of not knowing heart disease risk factors for two (cigarette smoking and family history of heart disease) of the nine risk factors.

The association between speaking native language and unawareness of smoking as a risk factor for heart disease is intriguing. American Indians have had (and still do have) a ceremonial and medicinal association with tobacco, predating European contact.²³ Findings of the Tobacco in Portland Indians convenience sample survey do not support the hypothesis that commercial

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tobacco users are more likely to use ceremonial tobacco. In fact, nonsmokers are more likely than smokers to use ceremonial tobacco.²⁴ Commercial tobacco may not be interpreted as harmful to health among American Indian native language speakers because of the Sapir-Whorf Hypothesis. The Sapir-Whorf Hypothesis states that intracultural communication is invariably intertwined with culture and that language not only describes our surroundings, but also how we experience it.²⁵ Native language speakers could mistakenly be associating ceremonial use of tobacco with harmful commercial use. Since speakers of their native language are less likely to know that smoking is a risk factor for heart disease, and since American Indians/Alaska Natives have the highest smoking prevalence, perhaps bilingual education on the health effects of smoking will increase awareness in this subgroup.

Similar to the present study, the Inter-Tribal Heart Project found that women were more likely than men to know heart disease risk factors.¹⁰ Par-

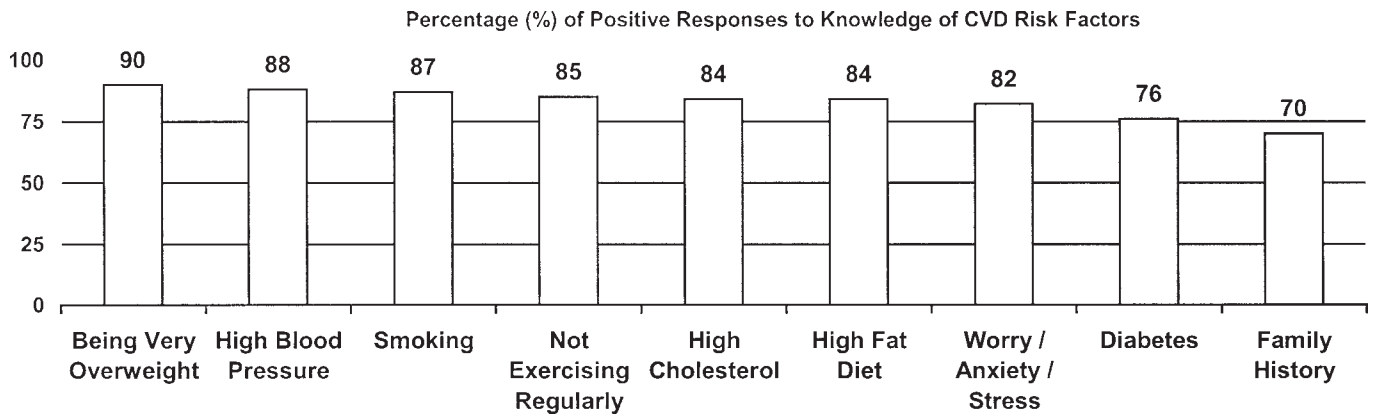


Fig 1. Overall awareness of heart disease risk factors: The Strong Heart Study

ticipants in the Inter-Tribal Heart Project were least likely to associate diabetes with heart disease risk, while the present study found family history of heart disease to be the least known risk factor for heart disease.¹⁰ Of the nine risk factors, diabetes followed family history as a less familiar risk factor (Figure 1). In order to assist tribal leaders and health planners to implement heart disease reduction programs, additional descriptive information on heart disease risk factor awareness has been published on SHS participants in the form of a community data book by the National Heart, Lung, and Blood Institute.⁵

Although overall knowledge of heart disease risk factors was high, more targeted education efforts are needed to reach lower awareness subgroups. We identified five sociodemographic and lifestyle attributes associated with lowered awareness of heart disease risk factors: living in Arizona and South/North Dakota, male sex, lower educational attainment, and smoking. Middle-aged and elderly American Indian populations with these characteristics would benefit most from heart disease risk factor education.

Smokers might be particularly resistant to current health education efforts. We found that nonsmokers had significantly more knowledge of

all nine heart disease risk factors than smokers. Nez Henderson et al found smoking cessation in SHS participants was associated with older age (65–74 years), daily cigarette consumption of fewer than six cigarettes, fewer years of smoking cigarettes, older age of smoking initiation (≥ 17 years), being from Arizona, and history of diabetes.²⁶

Improved and culturally appropriate smoking cessation and education approaches can raise awareness in current smokers and promote positive behavior changes. As an alternative to standard general population smoking cessation programs, the development of cessation curricula specifically for American Indian and Alaska Natives, such as the Second Wind program, have been created. The Second Wind smoking cessation program uses talking circles, American Indian/Alaska Native-specific discussions on culture, to alleviate stress and talk about traditional/sacred use of tobacco.²⁷ As of 2004, the American Legacy Foundation is funding 14 cessation, prevention, and education programs nationwide among organizations that serve American Indians and Alaska Natives.²⁸ The California Rural Indian Health Board is an outstanding resource and model for programs nationally in the development and implementation of American Indian and Alaska Native-specific tobacco programs.²⁹

Knowledge of risk factors may show cultural variation, and in the American Indian community knowledge can be influenced by native language, social and ceremonial use of tobacco, education, and dietary practices. Understanding risk factor awareness appears to be the key first step in reducing the rising tide of heart disease among American Indians and Alaska Natives.

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necessarily reflect those of the Indian Health Service.

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