Prevalence of Coronary Heart Disease Risk Factors Among Rural Blacks: A Community-Based Study

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ABSTRACT

Background. Coronary heart disease (CHD) remains the most common cause of death among blacks, and the difference in CHD mortality between blacks and whites is growing. This trend may be due in part to higher rates of CHD risk factors among blacks. This study was done to determine the prevalence of CHD risk factors among a population-based sample of 403 rural blacks in Virginia.

Methods. Community-based screening evaluations included the determination of exercise and smoking habits, blood pressure, height, weight, total and high-density lipoprotein (HDL) cholesterol, and glycosylated hemoglobin.

Results. The prevalences of smoking (32.5% of men, 20.0% of women), high cholesterol (16.6% of men, 18.9% of women) and sedentary lifestyle (37.5% of men, 66.7% of women) were similar to prevalences reported for other black populations. However, the prevalences of diabetes (13.6% of men, 15.6% of women), hypertension (30.9% of men, 43.1% of women), and obesity (38.7% of men, 64.7% of women) were higher than those reported elsewhere. Increased body mass index was significantly associated with higher prevalences of hypertension, diabetes, and low HDL cholesterol.

Conclusions. Innovative methods are needed to decrease the high risk factor prevalences among this population.

CORONARY HEART DISEASE (CHD) remains the leading cause of mortality among both black and white populations in the United States, despite recent impressive declines in overall CHD mortality.[1] However, CHD mortality is declining more rapidly in the white than in the black population.[2,3] In addition, regional differences in total and cardiovascular disease mortality have been shown for blacks. The existence of a high incidence of cerebrovascular disease in the Southeast has been recognized for many years, the so-called "Stroke Belt."[4] More recently, mortality from CHD has been shown to be higher in the Southeast[5]; among blacks living in New York City, those born in the Southeast have a higher CHD mortality than those born in the Northeast.[6]

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There is a variety of potential reasons for these trends, including differences in access to health care and/or differences in risk factor profiles.[3] Despite the importance of CHD among blacks and the growing disparity in CHD mortality between blacks and whites, there have been relatively few epidemiologic studies investigating CHD and CHD risk factors among blacks. Two large prospective studies of cardiovascular disease—the Charleston, South Carolina, and Evans County Heart Studies—began in 1960 and included substantial numbers of black participants.[7] Overall, they found coronary heart disease mortality to be lower among black men than white men,[7] and similar among black women and white women.[8] Levels of coronary risk factors were similar between racial groups, except that hypertension was more common among blacks.

These findings may not be relevant to the present time for several reasons. First, CHD mortality nationally is now greater for both black men and women than for the white population.[9] Also, data from the second and third National Health and Nutrition Examination

Surveys (NHANES II and III) indicate that obesity, diabetes, and hypertension are more prevalent among black than white Americans.[10-12]

The purposes of the present study were to determine the prevalence of CHD risk factors among a population of rural blacks and to compare these data with current national estimates for black Americans. Given the trends noted, we hypothesized that the overall prevalences would be higher among rural blacks in Virginia than among the national population.

METHODS

This study was done as part of the Alliance of Black Churches Health Project, an ongoing smoking cessation project among blacks in two rural Virginia counties.[13] The two counties have an adult black population of 7,147, which is 30.6% of the total population of the two counties. Data for the analyses were obtained during a 1992 to 1993 survey of the two counties. Data from the two counties were grouped together for analysis.

Data were collected in two phases. The first phase was a population-based house-to-house survey of black adults 18 years and older.[14] The second phase was a screening examination in which survey respondents were recontacted for measurement of various CHD risk factors, including serum total cholesterol (TC), serum HDL-cholesterol (HDL-C), blood pressure (BP), body mass index (BMI), and glycosylated hemoglobin (GlyHb).[15]

In the house-to-house survey, 1990 census data and direct observation were used to identify all street segments (adjoining census blocks) that were greater than 50% black and contained 10 or more black adults. Trained interviewers then visited each house on these segments. From those households with at least one black adult occupant, they created a roster of household residents, which included age, sex, and smoking status. Overall smoking prevalences for the two counties were calculated from these roster data. Using this approach, 3,744 of the 7,147 black adults (52%) in the two counties were rostered.

From these 3,744 adults, 1,679 individuals were systematically selected to receive a face-to-face survey, based on an algorithm that selected up to two residents per household. This algorithm purposely oversampled smokers to obtain a sufficient sample size for the smoking cessation study and to obtain approximately equal cohorts of smokers and nonsmokers. Of the 1,679 individuals selected by the algorithm, 1,148 (68.4%) completed the survey. Of the 531 survey noncompletions, 114 (21.5%) were due to refusals and 417 (78.5%) were due to a variety of other reasons, primarily the inability to contact the selected respondent after repeated attempts. Respondents who were the second smoker surveyed in a household answered only an abbreviated questionnaire, which did not include the CHD risk factor items. The 117 second smokers were therefore eliminated from the present sample, resulting in a survey sample size of 1,031.

The survey instrument was based on the 1990 Behavioral Risk Factor Surveillance Survey and was administered in the respondent's home. Smokers were defined as those who had smoked at least one cigarette per day for the previous 7 days. Self-reported high cholesterol was defined as a positive response to the question, "Have you ever been told by a doctor that you have high cholesterol?" Self-reported hypertension was assessed based on medication use and was defined by the question, "Are you now taking medicine for high blood pressure?" Body mass index (BMI) was calculated in kg/m^2 from reported heights and weights. Self-reported diabetes mellitus was defined as a positive response to the question, "Have you ever been told by a doctor that you have diabetes or sugar diabetes?" A respondent who did not exercise at least 20 minutes three times weekly was determined to have a sedentary lifestyle. The survey was administered orally by a trained interviewer, and the responses were directly entered into a laptop computer. The questionnaire took approximately 20 minutes to complete.

Survey respondents who agreed to follow-up were later contacted regarding their willingness to participate in a screening examination. Because of resource constraints, most were contacted by telephone. Of the 1,031 survey respondents, 771 (74.8%) had a telephone in their home, and another 102 (9.9%) could be reached by a neighbor's or relative's telephone; 403 (39.1%) received the screening examination, 197 (19.1%) refused, 316 (30.6%) could not be contacted, and 115 (11.1%) were contacted but could not schedule a screening time.

The respondents who were contacted for the screening had a 30-minute examination either at central locations or in their homes. Height and weight measurements were made after respondents removed shoes and heavy clothing. A single sitting BP was taken approximately 15 minutes into the examination. If this reading was <140/90 mm Hg, then the value was recorded as the respondent's BP. For those with an initial BP ≥140/90 mm Hg, a second sitting BP was taken approximately 10 minutes later, and the average of the two measurements was recorded as the BP. Finally, blood was drawn and transported on ice to the University of Virginia clinical laboratories, where it was analyzed for TC, HDL-C, and GlyHb. GlyHb measurements were made by an affinity chromatographic method (GlycoTest II GlyHb Assay, Pierce Chemical Co, Rockford, Ill).

Respondents' BMI was calculated in kg/m^2 from the height and weight measurements made at the screening examination. Following guidelines from NHANES II, men with a BMI of ≥27.8 kg/m^2 or women with a BMI of 27.3 kg/m^2 was considered overweight.[16] Men with a BMI ≥31.1 kg/m^2 and women with a BMI ≥32.3 kg/m^2 were considered severely overweight.[16] These levels of overweight correspond to 120% and 140% of ideal body weight (IBW), respectively, based on the 1983 Metropolitan Life Insurance tables.[16] Measured high TC and low HDL were defined according to National Cholesterol Education Program guidelines as ≥240 mg/dL and <35 mg/dL, respectively.[17] Respondents were determined to have definite high BP based on NHANES II criteria of a measured average BP of ≥160/95 mm Hg or a positive response to the question, "Are you now taking medicine for high blood pressure?"[18] Respondents were considered to have diabetes if they had a measured GlyHb value >7.0 or gave a positive response to the question, "Have you ever been told by a doctor that you have diabetes or sugar diabetes?" To maintain sample size, screening respondents with missing data for some measurements were not excluded from other analyses.

Statistical analyses were done on a personal computer using the Statistical Package for the Social Sciences version 4.01 (SPSS Inc, Chicago, Ill). All data were weighted to the age distribution of each county's black population, using race- and sex-specific proportions from the 1990 United States census. Data were also weighted by smoking status, using sex-specific prevalences from the roster database for each county. Chi-square analysis was used to determine the significance of differences in CHD risk factor prevalences between men and women. Logistic regression was used to determine the association between obesity and other risk factors. For these analyses, BMI was divided into three categories: <120%; 120% to 140%; and >140% IBW. Data were first analyzed separately for men and women and then combined if there was no significant interaction between sex and obesity.

TABLE 1. Comparison of Self-Reported Risk Factors for Surveyed (n = 1,031) and Screened Study Samples (n = 403)

	Men		*Women*	
	Survey	*Screening*	*Survey*	*Screening*
History of diabetes (%) (95% CI)	8.3 (6-11)	8.4 (4-13)	11.0 (8-14)	11.6 (8-16)
Obesity (self-reported) (%) (95% CI)	38.1 (34-43)	38.8 (31-46)	59.2 (55-63)	60.7 (54-67)
Taking high BP medication (%) (95% CI)	20.1 (16-24)	21.7 (15-28)	29.9 (26-34)	31.8 (26-38)
Sedentary lifestyle (%) (95% CI)	42.2 (37-47)	37.5 (30-45)	61.9 (56-66)	66.7 (61-72)
History of high cholesterol (%) (95% CI)	13.5 (10-17)	13.7 (8-19)	20.3 (17-24)	21.9 (17-27)

CI = Confidence interval.

RESULTS

The mean age of the screened sample (n = 403) was 44.4 years for men and 45.5 years for women. Among men, 51.0% were married, 50.6% were high-school graduates, and 60.2% were employed. Among women, respective values were 44.0%, 50.2%, and 47.6%.

Prevalences of self-reported CHD risk factors for the survey and screening samples are shown in Table 1. Results for the two samples are similar.

Age-specific and age-adjusted CHD risk factor prevalences obtained from the screening are shown in Table 2. Women had significantly ($P < .05$) lower total prevalences of low HDL-C and smoking and higher prevalences of hypertension, obesity, and sedentary lifestyle than did men.

The results of the logistic regression analysis are shown in Table 3. The prevalence of the three weight categories used in the analysis were as follows: <120% IBW–men 61.3%, women 35.3%; 120% to 140% IBW–men 25.2%, women 31.2%; and >140% IBW–men 13.5%, women 33.5%. The relationships between obesity and CHD risk factors were similar for men and women, except for sedentary lifestyle. The relationship was direct for men, but inverse for women, and the interaction between sex and obesity was significant ($P = .05$). In the analysis that combined men

TABLE 2. Prevalence of Coronary Heart Disease Risk Factors Among Blacks in Two Rural Virginia Counties

	*High Cholesterol** (%)	*Low HDL*†	*Taking High BP Medication* (%)	*Taking Medication or BP ≥160/95*	*History of Diabetes* (%)	*History of Diabetes or GlyHb ≥7.0 mg/dL* (%)	*Obese*** (%)	*Smoke* (%)	*Sedentary Lifestyle* (%)‡
Men (n = 165)									
18-34 yr	16.2	5.4	6.9	14.6	1.9	1.9	20.4	32.3	14.0
35-49 yr	13.5	43.7	17.1	31.1	2.7	7.0	61.9	36.4	51.9
50-64 yr	19.7	31.5	31.9	42.3	16.0	33.1	24.0	38.2	45.8
Over 64 yr	20.4	2.8	51.1	52.1	26.2	34.5	39.8	20.1	46.7
Total[§]	16.6	25.3[††]	21.7[††]	30.9[††]	8.4	13.6	38.7[††]	32.5[††]	37.5[††]
Women (n = 238)									
18-34 yr	4.5	4.1	9.7	18.4	1.7	1.7	64.1	23.6	67.4
35-49 yr	20.9	10.9	33.4	52.0	10.3	13.8	72.5	26.1	51.6
50-64 yr	31.9	7.7	52.6	67.4	24.1	30.2	72.9	19.0	67.6
Over 64 yr	30.4	0.0	50.5	55.0	19.7	51.2	49.6	7.5	82.3
Total[§]	18.9	5.5[††]	31.8[††]	43.1[††]	11.6	15.6	64.7[††]	20.0[††]	66.7[††]

*Measured total cholesterol ≥240 mg/dL.
†Measured high-density lipoprotein cholesterol <35 mg/dL.
**Body mass index ≥120% IBW.
‡Exercise <20 min/day three times/week.
§Weighted to the smoking and age distribution of the adult black population in the two counties.
††$P < .05$ for difference between men and women.

and women, obesity was significantly ($P < .05$) associated with increased total low HDL-C, diabetes and hypertension prevalences, but not with smoking or elevated cholesterol.

The results of these analyses were essentially the same when the sample was not weighted to the population smoking prevalence. The overall weighted and unweighted CHD risk factor prevalences were as follows: high cholesterol 17.8% vs 18.2%; low HDL-C 13.5% vs 13.3%; high BP 37.7% vs 35.7%; diabetes 14.2% vs 14.7%; obesity 53.4% vs 51.7%; and sedentary lifestyle 54.7% vs 53.6 %. Obesity remained significantly associated with low HDL-C, high BP, and diabetes in the unweighted analysis. In addition, smoking was significantly associated with lower BMI ($P = .04$), though the odds ratio was similar to that in the weighted sample (0.76 vs 0.84). This can be explained by the greater power of the unweighted sample to assess factors associated with smoking.

DISCUSSION

The CHD risk factor prevalences found in this population were similar to or higher than those reported among blacks nationally, with the exception of a sedentary lifestyle. The prevalences of high cholesterol in this study (16.6% of men, 18.9% of women) are similar to the prevalences reported in NHANES II (19.3% of black men, 19.0% of black women)[19] and in preliminary NHANES III data (16.0% of black adults).[20] HDL-C levels are generally higher among blacks than among whites, but there are few data on the overall prevalence of low HDL-C in blacks.[21,22] Low HDL-C in the study sample was much more common among men than women.

The results reported here for hypertension prevalence (30.9% of men, 43.1% of women) are higher than NHANES II (25.2% of black men, 32.7% of black women).[12] Data from NHANES III have recently been reported and show a decline nationally in the prevalence of hypertension to 22.8% among black men and 23.4% among black women.[12]

The prevalence of self-reported diabetes in this study (8.4% of men, 11.6% of women) is higher than in NHANES II. In that study, 4.5% of black men and 5.9% of black women reported having diabetes, and it was estimated that another 4.0% of black men and 4.6% of black women had undiagnosed diabetes.[11] We found similar percentages of undiagnosed diabetes. Combining undiagnosed with self-reported diabetes resulted in high total prevalences, especially among respondents over the age of 50, in whom the prevalences for both men and women exceeded 30%.

The overall smoking prevalence for blacks in the two counties (25.8%) was lower than the national prevalence for blacks in 1991 (29.2%),[23] but it was higher than that reported for blacks for the entire state of Virginia in that year (20.9%).[24]

The overweight prevalences in this study (38.8% of men, 64.3% of women) are much higher than those reported for blacks in both

TABLE 3. Relationship Between Body Mass Index* and Other Coronary Heart Disease Risk Factors

	Men		Women		Combined	
	Odds Ratio	*95% Confidence Interval*	*Odds Ratio*	*95% Confidence Interval*	*Odds Ratio*	*95% Confidence Interval*
High cholesterol (≥240 mg/dL)	.92	.51, 1.65	1.52	.99, 2.34	1.21	.87, 1.69
Low HDL-C (<35 mg/dL)	2.49	1.52, 4.06	1.90	.90, 3.99	2.33	1.55, 3.53
Taking medication or BP ≥160/95	1.46	.91, 2.34	2.06	1.43, 3.01	1.79	1.36, 2.35
History of diabetes or GlyHb >7.0	1.79	.94, 3.41	1.43	.88, 2.34	1.56	1.05, 2.30
Smoke	.82	.52, 1.32	.84	.57, 1.25	.84	.63, 1.14
Sedentary lifestyle†	1.25	.81, 1.92	.61	.43, .87	–	–

*Body mass index divided into 3 categories: <120%, 120% to 140%, >140% IBW.
†Combined odds ratio not calculated due to significant interaction between BMI and sex.

NHANES II (26.3% of men, 45.1% of women) and preliminary NHANES III data (31.2% of men, 48.6% of women).[10] In contrast, the prevalences of sedentary lifestyle in our study (41.5% of men, 61.6% of women) were lower than found nationally in NHANES III (50% of black men, 67% of black women).[25]

The prevalence of hypertension, obesity, and diabetes are higher in these two counties than in recent national studies. Since we did not directly compare the results to other groups, it is not possible to determine if our findings are related to socioeconomic status, geographic location, or other variables. There are few other population-based studies from the Southeast with which to compare the results. Both the Evans County and Charleston studies collected risk-factor data only at baseline, more than 35 years ago.[7,8] A more recent population-based study of hypertension among blacks was done in Pitt County, North Carolina. In this study, the hypertension prevalence varied from 23.4% to 25.5% depending on socioeconomic status.[26] These are also much lower than we found. On the other hand, obesity levels were only slightly lower in Pitt County (36.1% of men, 57.4% of women),[27] and the prevalences of sedentary lifestyle were similar to those we found (40.2% of black men, 62.4% of black women).[28]

Our finding that increasing BMI is associated with other CHD risk factors has been reported for blacks in other studies.[21,22,29,30] We have also reported on this relationship in a study of the association of cigarette smoking with CHD risk factors.[15] In that study, we found that increasing BMI was significantly associated with decreased HDL-C and with increased systolic and diastolic BP and GlyHb among both men and women. The current study expands on these associations by grouping subjects into diagnostic categories based on standard definitions, which include those with treated hypertension and diabetes. The relationships found were all in the expected direction, with the exception of a decrease in sedentary lifestyle with increasing BMI among women. This may have been due to the definition of exercise used, which included the statement that it is an activity "that makes you sweat or makes your heart beat fast." Overweight women may have had these effects with less exertion and thus classified more activities as exercise than thinner women.

There are several potential limitations of this study. First, the sample we screened was not random. Although the initial survey procedure resulted in a representative population-based sample of blacks from the two study counties, recontacting selected survey respondents proved logistically difficult because of the remote area and the number of individuals without telephones. Those who were more easily recontacted were thus more likely to receive the screening examination, and they may represent a more affluent subset. Nonetheless, the self-reported CHD risk factor prevalences were similar to those of the larger survey group (Table 1). Thus, we believe that the screening data give a reasonably representative profile of the black population of these counties. In addition, although smokers were oversampled, the results were similar whether this was considered in the analyses.

The second potential limitation is the use of glycosylated hemoglobin as a screening tool for diabetes. This measure was chosen for practical reasons. It does not require a fasting state, and it demands less time and coordination between the respondent and interviewer than an oral glucose tolerance test (OGTT). The efficacy of glycosylated hemoglobin for diabetes screening, however, remains uncertain. Several authors[31-33] have advocated its use, while others[34,35] have argued that the values for normals and for mild diabetics overlap too much for GlyHb to adequately substitute for an OGTT. In the present study, if the cut-off level for diabetes is raised to 8.0 to decrease the possibility of false-positive diagnoses, the total (self-reported and measured) prevalence is still high at 12.3% (12.7% for women and 11.8% for men). Among those over the age of 50 years, the overall prevalence is 26.8%. Thus, even with this more conservative definition, over one fourth of the older adult population would be considered to be diabetic.

Our results indicate that there are high CHD risk factor prevalences among this population, especially obesity and the related conditions of hypertension and diabetes. The reasons for obesity being so common in this population are poorly understood and certainly multifactorial. Cultural perceptions of weight probably play a role, since there is less emphasis on thinness as an ideal body image.[36] Specific behaviors, including dietary and exercise habits, must also be important.[10] Whatever factors are operant, they must begin at an early age since the prevalence of overweight is already more than 60% among women aged 18 to 35.

Mortality from CHD has been falling more slowly among blacks than among whites, and differences in the prevalence of CHD risk factors may account for some of this disparity.[37] Further study will be needed to determine the impact of the high-risk factor prevalences on the occurrence and outcome of CHD in this population. However, based on present recommendations, efforts are needed now to address the high prevalence of CHD risk factors in these communities.[1] Since mainstream health education efforts can fail to reach rural blacks, innovative methods may be needed to decrease the prevalence and impact of CHD risk factors in this and similar populations.

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