Smoking Cessation and Its Determinants Among Older American Indians: The Strong Heart Study

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Objective: To examine the relationship between sociodemographic, clinical, and smoking history factors, and smoking cessation among older American Indians.

Design: Nested cohort study of cigarette smokers in the Strong Heart Study, a longitudinal study of cardiovascular disease among American Indians.

Setting: Thirteen American Indian tribes from Arizona, Oklahoma, and North and South Dakota.

Participants: American Indian men and women (*N*=998), aged 45–74 years, who identified themselves as smokers at the initial Strong Heart Study examination.

Measurements and Main Results: Twenty-one percent of smokers quit during the 4-year follow-up period. Multivariate logistic regression was used to assess the relationship between baseline sociodemographic, clinical, and smoking history factors, and smoking cessation. Factors associated with smoking cessation included being65–74 years old (odds ratio [OR] 2.1; 95% confidence interval [CI], 1.3 to 3.3), being examined at the Arizona regional center (OR 2.2; 95% CI 1.3, 3.7), being non-daily smokers (OR 5.4; 95% CI 1.3, 18.5), smoking fewer than 6 cigarettes daily(OR 2.8; 95% CI 1.3, 4.7), being a smoker for fewer years(OR 2.0; 95% CI 1.0, 3.9), beginning to smoke at an older age(17 years or older, OR 1.6; 95% CI 1.1, 2.4), and having a history of diabetes (OR 1.7; 95% CI 1.2, 2.3). Factors not associated with smoking cessation included gender, level of education, childhood exposure to tobacco smoking, and a history of cardiovascular diseases, cancer, or respiratory diseases.

Conclusion: Several determinants of smoking cessation among older American Indians identified in this study may have important implications for designing appropriate interventions for this special population. (*Ethn Dis*. 2004;14: 274–279.)

Key Words: Determinants, North American Indian, Smoking Cessation

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Introduction

The World Health Organization has identified smoking cessation as a cornerstone for protecting the public's health,[1,2] since smoking is the leading cause of preventable death among industrialized populations.[3,4] While smoking rates have been declining within the US general population, many American Indians and Alaska Natives tribes and communities are experiencing increasing rates of smoking.[5,6] Indeed, smoking prevalence among older American Indians is the highest in the nation, with rates of up to 45% in some communities—a rate nearly 20% greater than that observed in the general US population.[7] The increase in smoking has been accompanied by rising rates of mortality from cardiovascular disease and lung cancer, conditions which are leading causes of death among American Indians and Alaska Natives.[8,9] Since health benefits experienced by older smokers upon quitting are significant, including improvements in circulation and respiratory function, and a decreased risk of myocardial infarction and stroke,[10,11] smoking cessation is of considerable importance to improving the health of older American Indians.

A few studies have examined smoking cessation among younger American Indians, but little is known about smoking cessation and its determinants among the older American Indian population.[12,13] Studies in other elderly populations have shown that income and education are strong determinants of smoking cessation.[14,15] Studies have also demonstrated that age at smoking initiation, daily amount of cigarette consumption, duration of smoking, and the presence of co-morbid diseases, are factors associated with smoking cessation in older populations.[16–18] The objective of this study is to examine the relationship of selected sociodemographic, clinical, and smoking history factors to smoking cessation, using data from the Strong Heart Study, a study of cardiovascular disease and its risk factors among American Indians.

Subject and Methods

Data Source

Data for the present study were obtained from the Strong Heart Study—a longitudinal, population-based study examining cardiovascular disease among a large and diverse cohort of American Indians. The study design, survey methods, and laboratory techniques of the Strong Heart Study have been described previously.[19] Briefly, American Indians aged 45 to 74 years from 13 tribes in 3 regional centers (Arizona, Oklahoma, and South/North Dakota), were recruited for the baseline examination from 1989–1991. The participation rates of all age-eligible tribal members were 72% in the Arizona center, 62% in the Oklahoma center, and 55% in the Dakota center. All participants provided

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written informed consent, under protocols approved by participating tribes and the Indian Health Service Institutional Review Boards.

Data used in the present study included information on age, gender, education level, self-reported history of cardiovascular disease (hypertension, heart attack, stroke, or heart failure), diabetes, cancer, and respiratory disease (asthma, chronic bronchitis, or emphysema). Smoking status at baseline was ascertained by asking participants whether they had ever smoked more than 100 cigarettes in their life, whether they were current smokers at the time of the initial examination, and if they smoked cigarettes on a regular basis. If participants answered "yes" to all 3 questions, they were classified as *smokers.* Information regarding daily cigarette consumption, years of smoking, age at initiation of smoking, and childhood exposure to environmental tobacco smoke, was also obtained. All Strong Heart Study participants were counseled about the risks of smoking during the initial medical examination.

The cohort was re-examined between 1993 and 1995, as part of the Strong Heart Study second examination (mean length of follow-up ~4 years). The re-examination rate for the surviving cohort members was 88%. Smoking status was ascertained again during the second examination, using the same smoking status questions asked at baseline. Participants were classified as *ex-smokers* if they were no longer current smokers. Of 4,549 participants at baseline, 1,533 were classified as smokers. Of these, 149 (10%) died before the second examination; 199 (13%) were lost to follow-up, or refused to participate in the examination; and 139 (9%) had incomplete sociodemographic, smoking, or clinical information, and were, therefore, excluded from the present analysis. A total of 998 participants (of which 14% were from the Arizona center, 37% from the Oklahoma center, and 49% from the Dakota center) were included in this study of smoking cessation.

Analyses

Descriptive analyses examined the prevalence of smoking cessation according to each of the individual sociodemographic, clinical, and smoking history baseline characteristics. Covariates were grouped into logical categories, based on demography, smoking characteristics, and chronic disease history. Differences in the prevalence of smoking cessation by baseline characteristics were assessed using chi-square tests. Statistical significance was set at the $P<.05$ level. Multivariate logistic regression was used to obtain adjusted odds ratios (OR) and 95% confidence intervals (CI) of factors associated with smoking cessation. Confidence intervals (CI) that did not include unity were interpreted as statistically significant. We examined the data separately by age, gender, and region, and found no evidence of different patterns of association between baseline characteristics and smoking cessation; this was confirmed by the absence of significant interaction terms between age, gender, or region, and the other covariates in the multivariate logistic regression model. Data analyses were performed using SPSS 11.5 software.[20]

RESULTS

Of the surviving 998 baseline smokers analyzed in this study, 212 (21%) had quit by the time of the second examination. The prevalence of smoking cessation at the second examination, as well as the results of the univariate and multivariate logistic regression of baseline characteristics associated with smoking cessation, are presented in Table 1. Respondents in the older age stratum were 2 times more likely to quit smoking, compared to those in the younger cohort. Compared to the other regions, participants from the Arizona regional center were twice as likely to quit. Smoking cessation was also associated with individuals who were non-daily smokers, those consuming fewer than 6 cigarettes a day, smoking 3 years or less, and smoking initiation at age 17 years or older. Individuals with a history of diabetes were also more likely to quit smoking, compared to those without diabetes. Although in the crude analysis, the association between smoking cessation and history of cardiovascular disease was significant, this relationship was weak, and not statistically significant, in the multivariate regression analyses. Other factors not associated with smoking cessation included gender, education level, childhood exposure to tobacco smoking, and history of cancer and respiratory diseases.

DISCUSSION

Older American Indians have alarmingly high rates of smoking, making smoking cessation of vital importance to the health of this population.[5,7] This study is the first to examine the influence of sociodemographic factors, smoking patterns, and history of chronic diseases on smoking cessation in older American Indians. In this community-based cohort study, the overall cessation rate was 21%. This rate is high compared to reported spontaneous quit rates, or quit rates reported following formal interventions among the general population.[21,22] Several significant determinants of smoking cessation were

identified that both support and refute the findings of others. Understanding these determinants and their similarities to, and differences from, those observed in other populations, may inform and improve the development of future interventions and public policy decisions.

Of the demographic characteristics examined, older age, but not gender or education, was significantly associated with smoking cessation. The observed association between older age and cessation is consistent with findings from other population-based studies.[23,24] While many studies have provided evidence of gender differences in smoking cessation,[25,26] with men more likely to quit smoking than women, we found no such association after controlling for other demographic factors, smoking patterns, and clinical covariates. Furthermore, in the general population, socioeconomic factors, mainly high educational attainment, are strongly associated with smoking cessation.[15] Some studies have demonstrated that American Indians with higher levels of education smoke more, compared to those with less education.[27] In contrast, we observed a non-significant trend toward higher cessation rates with increasing education. There is a relatively narrow range of education among the Strong Heart Study participants. Follow-up studies with larger numbers of participants, or among participants of younger ages, may further clarify this association.

The striking association of the Arizona regional center with cessation is intriguing. Of note, the baseline prevalence of smoking varies significantly between the Strong Heart Study regional centers (Dakota center=49.2%; Oklahoma center=34.1%; Arizona center=21.3%).[7] The mean number of cigarettes smoked per day among current smokers at baseline examination also varied significantly by center (Dakota center=13.2; Oklahoma center=11.8; Arizona center=6.9).[7] These large differences in smoking patterns observed in the regional centers may be due to several factors, such as individual tribal practices, beliefs, and behaviors toward smoking, as well as to the use of tobacco for ceremonial purposes, and the degree of acculturation among the individual tribes of the regional centers. In addition, it is unknown if tribal or local smoking interventions or specific tobacco control policies that could effect smoking cessation rates were available, or selectively enacted, during the study period at the Arizona center. Further-

Table 1. Characteristics associated with smoking cessation among 998 American Indian Smokers: The Strong Heart Study

Baseline Characteristics	Ex-smokers *N* (%)	Adjusted OR (95% CI)§
Total	212 (21)	
Gender		
Male	91 (20)	1.1 (0.8, 1.6)
Female	121 (22)	1
Age		
45–54 years old	78 (20)	1
55–64 years old	76 (19)	0.9 (0.6, 1.4)
65–74 years old‡	58 (29)	2.1 (1.3, 3.3)
Education		
<9 years	35 (20)	1
9–12 years	119 (21)	1.3 (0.8, 2.1)
>12 years	58 (22)	1.7 (0.9, 2.9)
Regional centers		
Dakota	96 (20)	1
Oklahoma	69 (19)	1.4 (0.9, 2.1)
Arizona*	47 (33)	2.2 (1.3, 3.7)
Daily cigarette consumption		
Nondaily smokers (<1 cigarette/day)*	16 (46)	5.4 (1.3, 18.5)
1–5 cigarettes*	118 (31)	2.8 (1.3, 4.7)
6–20 cigarettes	49 (16)	1.3 (0.6, 2.5)
More than 20 cigarettes	29 (11)	1
Years of cigarette smoking		
<4*	23 (40)	2.0 (1.0, 3.9)
4–15	49 (31)	1.5 (.9, 2.5)
16–30	66 (20)	1.2 (0.8, 1.9)
>30	74 (17)	1
Age of initiation		
16 years old or less	56 (16)	1
17 years old or more†	156 (24)	1.6 (1.1, 2.4)
Childhood exposure to smoke		
Parents or guardian smoked	165 (21)	1
Parents or guardian did not smoke	47 (24)	0.8 (0.5, 1.2)
History of chronic disease		
CVD‡		
No CVD	105 (25)	1.2 (0.9, 1.7)
Diabetes*	95 (29)	1.7 (1.2, 2.3)
No diabetes	117 (17)	1
Cancer	16 (25)	1.4 (0.7, 2.7)
No cancer	196 (21)	1
Respiratory	32 (18)	0.8 (0.5, 1.3)
No respiratory	180 (22)	1

* $P<.001$; † $.001<P<.01$; ‡ $.01<P<.05$.
§ OR=odds ratio, CI=confidence interval; each odds ratio is adjusted for all other variables in the model.

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more, Behavioral Risk Factor Surveillance System data show a temporal trend in the reduction of cigarette smoking over the period including SHS Phases I and II (1989 to 1995).[28,29] For example, during this 6-year period, residents of Arizona reduced their smoking rates by 3.6% (26.5% to 22.9%), while residents of South Dakota reduced their rates by 0.6% (22.4% to 21.8%). During this period, many states made strong efforts to promote cessation among their populations. However, it should be noted that BRSS is a telephone-based survey study, and based on previous studies, a large percentage of reservation-dwelling American Indians were excluded because they lacked telephone access.[30,31] Finally, broader influences, such as cultural and community norms, as reflected by the lower prevalence of smoking in the Arizona center, may increase the pressure or desire to quit smoking.

Several factors associated with smoking cessation in the general population were also observed in the Strong Heart Study participants. For example, later age of smoking initiation, lower daily consumption of cigarettes (including non-daily smokers), and few years of smoking, are factors that predicted smoking cessation. These findings are consistent with those of other studies that suggest smokers who begin smoking at a later age, consume fewer cigarettes, and smoke for fewer years, are less dependent on nicotine, and can more easily stop smoking.[32] This finding is notable, since the cohort is an older population with smoking patterns that differ from the majority culture. For example, the daily average cigarette consumption among active smokers in the Strong Heart Study has been shown to be much lower than that of the general population (10.4 cigarettes/day vs 21.4 cigarettes/day).[7] Finally, although smoking cessation rates increase with longer duration of smoking,[32] presumably due to the development of smoking-related health complications, this association was not observed in our study. Likewise, childhood exposure to parental or guardian smoking did not have an independent effect on cessation.

Of the chronic diseases examined in this study, diabetes was the only one strongly associated with smoking cessation. Recently, concerted efforts have been made to educate American Indian and Alaska Native tribes and communities about the devastating effects of diabetes and smoking. For example, most Indian Health Service hospitals and clinics have formal and, to varying degrees, comprehensive, diabetes care programs. Such efforts may increase smoking cessation among individuals with diabetes. In contrast, having a history of cardiovascular disease, respiratory diseases, or cancer, was not associated with smoking cessation, perhaps reflecting a low perceived risk of smoking-related complications. Studies in other populations have demonstrated that smokers with cardiovascular diseases often do not believe smoking increases their risk of suffering a myocardial infarction.[33] The education of these high-risk groups regarding the long-term benefits of cessation should be a priority for healthcare providers.

Several limitations should be noted in the interpretation of our results. First, although 13 American Indian tribes from 3 distinct locations are represented in this study, these results may only be generalized to middle-aged and elderly American Indians who live in tribal communities. This study cannot address the issue of smoking cessation among urban American Indians and Alaska Natives. Second, participants who either died prior to the second examination, or were lost to follow-up, were excluded from the analyses. Such individuals may have been more likely to continue smoking than the cohort under study, thereby inflating the cessation rate seen in this study. A third limitation is that self-report was used to ascertain smoking status and history of chronic disease. These self-report measures were not validated through chart review, clinical test, or formal questionnaire validation. Previous studies have shown that self-reporting of smoking status can introduce bias toward a socially desirable response.[34–36] Finally, it is unknown if study participants were involved in a smoking cessation intervention between the baseline and follow-up examinations. Therefore, counseling or other interventions may explain, in part, the high spontaneous quit rate observed in this study.

In conclusion, this study has provided information regarding possible determinants of smoking cessation among older American Indians. This study has also demonstrated that these determinants, as well as smoking patterns themselves, among Strong Heart Study participants differ from those of the general population. These unique characteristics can be used to help tribal leaders, tribal health departments, and the Indian Health Services, develop and implement tribal-specific and culturally sensitive smoking interventions, prevention, and control policies. The alarming rates of smoking and smoking-related diseases among older American Indians are likely to continue to rise unless tribal efforts are supported at both the federal and state levels. For example, revenues from the state tobacco settlement funds could be used to help local communities develop smoking education, prevention, and cessation interventions for older American Indians. However, since most

tribes, especially their older members, view tobacco as a sacred plant, and utilize it for ceremonial purposes, a culturally appropriate approach will be required to effectively address the devastating effects of cigarette smoking among older American Indians.

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